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HAMPP (H.). **Bekämpfung des Sommer-Erdflohbefalles im Kopfengarten.** [Measures against Summer Infestation by Flea-beetles in Hop Fields.]—*Allg. Brau.- u. Hopfenztg* **75** p. 320 et sqq. [Nürnberg] 1935. (Abstr. in *Neuheiten PflSch.* **29** no. 5 p. 195. Vienna, October 1936.)

To combat the flea-beetle [*Psylliodes attenuata*, Koch] attacking hops in Germany, a band of adhesive, about an inch wide, has been found effective. It is applied round the hop vines about 3½ ft. from the ground, one or two pairs of leaves being removed at the place where it is smeared on. After the bands have been applied, the flea-beetles already on the plants must be shaken off twice within a few hours. They cannot crawl past the band and merely defoliate the plant below it. About 2,700 plants were treated with about 16 lb. of material.

SCHIMITSCHEK (E.). **Forstschädlingsauftreten in Oesterreich 1927 bis 1933.** [Forest Pests in Austria from 1927 to 1933.]—*Zbl. ges. Forstwes.* **61** pp. 134–150, 165–177, 208–221, 6 figs., 1935. (Abstr. in *Neuheiten PflSch.* **29** no. 5 pp. 195–196. Vienna, October 1936.)

The pests recorded include: *Coraebus fasciatus*, Vill. (*bifasciatus*, Ol.), which ringed the branches of oaks; *Melanophila* (*Phaenops*) *cyanea*, F., which has one generation a year and was a primary pest of Austrian pine [*Pinus nigra* var. *austriaca*]; *Agrilus viridis*, L., which killed all the alders left in a felled area, the infestation being favoured by the warmth of the cambium zone; *Saperda punctata*, L., on dying elms; *Otiorrhynchus niger*, F., which attacked the roots of pine and spruce; *O. raucus*, F., which infested Austrian pines in nurseries; *Hyponomeuta euonymellus*, L., which was controlled on *Prunus padus* by an oil emulsion spray; *Ocneria detrita*, Esp., which defoliated oaks 30 years old, but was successfully controlled with a spray of nicotine and soap; and *Lecanium corni*, Bch., which killed large ash trees in the Vorarlberg district.

GROSSMANN (H.). **Altes und Neues von der kleinen Fichtenblattwespe** (*Nematus abietum* **Htg.**). [Old and new Information on *Lygaeonematus abietinus*, Christ.]—*Schweiz. Z. Forstwes.* **87** pp. 33–41, 4 figs., 1936. (Abstr. in *Neuheiten PflSch.* **29** no. 5 p. 196. Vienna, October 1936.)

A pair of great tits [*Parus major*] confined in an aviary over spruce trees in Switzerland kept them free from injury by larvae of *Lygaeonematus abietinus*, Christ (*Nematus abietum*, Htg.). It is suggested that this bird should be encouraged by providing nesting boxes and food for the winter.

KUNTZE (R.). **Notizen über einige einheimische** *Lophyrus*-**Arten, Hym. in Sylwan.** [Notes on some native species of *Lophyrus* in Sylwan.]—*Publ. Soc. forest. Pologne* Sér. A., Mem. 4 pp. 1–12. Lwow, 1935. (Abstr. in *Neuheiten PflSch.* **29** no. 5 p. 196. Vienna, October 1936.)

In the last stage of an outbreak of *Diprion* (*Lophyrus*) *frutetorum*, F., in West Poland, the parasitism of the larvae in their cocoons was

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investigated. The Eulophid, *Microplectron fuscipenne*, Zett., emerged from 13 per cent. of the cocoons. Other species obtained were the Ichneumonids, *Microcryptus basizonus*, Grav., *Lamachus lophyrorum*, Htg., *Mesochorus fulgurans*, Hal., *Hypsantyx impressus*, Grav., and *Zemiophorus scutulatus*, Htg., and the Tachinid, *Ceromasia inclusa*, Htg. *M. fulgurans* is a hyperparasite, attacking *C. inclusa*.

SEITNER (M.). *Larentia variata* **v.** *cembrae* **Kitt. und andere an der Zirbe lebende Grossschmetterlinge.** [*Cidaria variata* var. *cembrae* and other Macrolepidoptera living on the Cembran Pine.].—*Zbl. ges. Forstwes.* **61** pp. 293–296, 1 fig., 1935. (Abstr. in *Neuheiten PflSch.* **29** no. 5 p. 197. Vienna, October 1936.)

In Austria, the adults of the Geometrid, *Cidaria* (*Larentia*) *variata* var. *cembrae*, Kitt., which has one generation a year, are on the wing in June–August. The larvae attack Cembran pines [*Pinus cembra*] in late summer, they hibernate in the ground litter and pupate in a very loose web. Mass outbreaks do not occur, partly owing to the action of parasites. The young larvae are parasitised by the Braconid, *Meteorus scutellator* var. *unicolor*, Wesm., and the Ichneumonids, *Hemiteles* sp., *Anilastus boops*, Thoms., and *Gelis* (*Pezomachus*) *nigritus*, Först., and the older ones by the Encyrtid, *Litomastix* sp., up to 220 individuals of which can be found in a single host. A list is given of other Macrolepidoptera that occur on Cembran pine, but are not pests of any importance.

STEINBERG (D. M.) & KAMENSKY (S. A.). **Les prémisses oecologiques de la diapause de** *Loxostege sticticalis* **L. (Lepidoptera, Pyralidae.)**—*Bull. biol.* **70** fasc. 2 pp. 145–183, 2 graphs, 50 refs. Paris, 1936.

A detailed account is given of laboratory experiments carried out in Leningrad in 1933 and 1934 to determine the factors that cause the diapause in larvae of *Loxostege sticticalis*, L., over 5,000 individuals being used. At constant temperatures, the number of larvae that entered a diapause varied with the season, almost all doing so in autumn, winter and spring, and only very few in summer. The authors believe this to be due to differences in nutritional conditions, since if the latter were favourable in winter the larvae failed to diapause, and the apparent cyclic regularity of the phenomenon was thus broken. In experiments conducted from June to October at 25°C. [77°F.], in which larvae were fed on beet planted at different dates, the age of the plants did not noticeably affect the incidence of the diapause, but the conditions under which they were grown played an important part in inducing or inhibiting it. The minimum number of diapausing larvae occurred among those that were fed on beet cultivated under optimum conditions. At 20°C. [68°F.], however, the age of the beet was of importance, since larvae fed on older plants developed more slowly and a greater number entered a diapause. From these and other experiments, in which the percentage of larvae that entered a diapause varied on different food-plants and was reduced when they were reared singly, it is concluded that the diapause is mainly a reaction to unfavourable nutritional conditions.

The percentage of larvae that entered a diapause was also increased at lower temperatures and as the season advanced, all the larvae doing so in September and October at 19–25°C. [66·2–77°F.]. When, however, the temperature in October was raised to 30–31°C. [86–87·8°F.] and 33–34°C. [91·4–93·2°F.], 10 and 91 per cent. of the larvae respectively failed to diapause. Thus, as autumn advances and the conditions under which the plants grow become worse, the larvae diapause more readily, and the processes of metabolism and gaseous exchange that would prevent them from doing so can only be maintained by high temperatures. It was found that the larvae will pupate without diapausing at temperatures above 32°C. [89·6°F.], provided that they are kept under these conditions from the early instars, but not if exposure to high temperature only begins in the fourth instar. A fall or rise in temperature after the larvae had ceased feeding retarded development, but did not induce them to enter a true diapause [*cf. R.A.E.*, A **22** 468]. The authors believe that the duration of the development of the different generations at equal temperatures depends on the quality of the food [*cf.* **23** 668] ; the number of larvae that entered a diapause was reduced if they had developed rapidly. It was found that a higher water content of the food-plant reduced the percentage of diapause in summer, but not in autumn [*cf.* **24** 673].

The duration of the diapause varies with different groups of larvae, which may be explained by the fact that at the end of the period of feeding the physiological condition of the larvae is not uniform. The longest diapause occurred in the larvae of the summer generations. Observations on the changes that take place in the organism of the larvae during diapause showed that the daily loss in weight increased with the temperature, which indicates that metabolism increases. It was also found that the daily loss in weight steadily decreases as the diapause continues. At a given temperature the intensity of metabolism varied with different individuals.

The diapause is believed by the authors to be an adaptation to conditions of hibernation, since the larvae are only able to resist cold in this state [*cf.* **23** 564]. Diapause that begins in summer is prolonged, and secures the preservation of the species if the new generation fails to develop owing to unfavourable conditions.

[Nefedov (N. J.).] **Нефедов (Н. И.). The Influence of Temperature on the Catches of Acrididae.** [*In Russian*].—*Fauna & Ecology* no. 2 pp. 237–248, 4 refs. Moscow-Smolensk, West. reg. Complex sci. Res. Inst. Smolensk St. pedagog. Inst., 1934. [Recd. December 1936.]

In the course of studies of the daily migrations of Acridids in the Troitzk reserve, Ural region, made by sweeping with a net, it was found that the numbers of individuals caught by 200 strokes differed not so much with the habitat and the time of the day, as with the air temperatures [*cf. R.A.E.*, A **24** 477].

The catches are grouped according to temperatures and statistically analysed. The smallest catch per 200 strokes (9·2) was at temperatures below 10°C. [50°F.], probably owing to the concentration of the Acridids in the lower levels of the grass cover. As the temperatures rose, the catches increased ; they were 15·6 at 11–15°C. [51·8–59°F.], 18·1 at 16–20°C. [60·8–68°F.], and over 23 at higher temperatures, at which the differences were not significant.

[Zolotarev (E. Kh.).] **Золотарев (Е. Х.). The Migratory Locust (*Locusta migratoria* L.) of the Povolzhje (Middle Volga Region).** [*In Russian.*]—*Bull. Soc. Nat. Moscou* (N.S.) Sect. Biol. **45** no. 4 pp. 285–293, 12 refs. Moscow, 1936. (With a Summary in English.)

A biometrical study of the solitary and gregarious phases of *Locusta migratoria*, L., inhabiting the sandy river terraces of the Middle Volga region has shown that they are intermediate in size and degree of sexual dimorphism between *Locusta migratoria rossica*, Uv. & Zol. (for which the author uses the name *danica* L. [*cf. R.A.E.*, A **18** 55]) and *L. m. migratoria*, L., as occurring in central and southern Russia, respectively [*cf.* **17** 139 ; **24** 759]. The locusts inhabiting the Middle Volga region are relics of the southern race, which, in the warmer sub-boreal period, was more widely distributed than now. Their smaller size and greater variability in comparison with this is probably due to less favourable conditions of existence [**24** 451]. In view of these considerations, the whole question of dividing the Russian forms of *L. migratoria* into geographical races should be re-considered.

[Berezhkov (R. P.).] **Бережков (Р. П.). Materials for the Study of Baits in the Control of non-swarming Acrididae.** [*In Russian.*]—*Bull. W. Siber. Plant Prot. Sta.* no. 1 (9) pp. 3–39, 14 refs. Novosibirsk, 1935. [Recd. November 1936.]

This is a preliminary account of the results of experiments in West Siberia on the use of different poison baits against non-swarming grasshoppers, mainly *Chorthippus albomarginatus*, DeG. The baits were prepared by moistening the carrier with a solution of a given amount of poison, and broadcast by hand at the rate of 60 litres of bait per hectare [5¼ gals. per acre] ; the amount of poison applied is estimated in gm. per hectare. The decrease in the numbers of Acridids on experimental plots, the most convenient size for which was found to be 3,000–3,500 sq. yards, was estimated by sweeping with a net along the diagonal of the plot. The numbers of Acridids caught by a set of 5 double sweeps were counted, and the average for 4 such sets was regarded as the index of the population. The percentage of mortality was calculated on the basis of averages taken just before and then 24, 48 and 72 hours after broadcasting the bait. The ratio of the percentage on a given plot to that on a plot treated with a bait of horse-dung and sodium arsenite, on which 600 gm. poison was applied per hectare [8½ oz. per acre], was taken to be the coefficient of effectiveness.

Paris green invariably gave a uniform and high percentage of mortality, the best results being obtained when it was used at the rate of 500 or 600 gm. per hectare, with horse-dung or sawdust, respectively. Calcium arsenite at the rate of 500 or 450 gm. per hectare had a coefficient of effectiveness of 0·9 when mixed with horse-dung, but was less successful with sawdust. Sodium arsenite at the rate of 600 gm. per hectare gave uniformly satisfactory results, but was also less effective with sawdust. Calcium arsenate and particularly sodium fluoride did not produce high mortality, the coefficient of effectiveness of the latter being only 0·7. Sodium fluosilicate, used at the rate of 1,250, 1,000 and 750 gm. per hectare gave, in all cases, a coefficient of 1, suggesting that it could completely replace arsenical compounds. Of the carriers, horse-dung was the most attractive to the Acridids, among

which *C. albomarginatus* predominated ; the attraction of wheat bran varied and that of sawdust was the least of all.

In general, baits were effective even when used against the first and second instars. Rainfall, particularly when it fell immediately after broadcasting, reduced their effectiveness, but did not completely eliminate it.

[Ratanov (K. N.).] **Ратанов (К. Н.). Description of the Egg-pods of Acrididae.** [*In Russian.*]—*Bull. W. Siber. Plant Prot. Sta.* no. 1 (9) pp. 40–70, 25 figs., 15 refs. Novosibirsk, 1935. [Recd. November 1936.]

Descriptions are given of the egg-pods of 55 species of Acridids, mostly belonging to West Siberian fauna, with a key for the determination of those most commonly found.

[Strakhovskiĭ (A. N.).] **Страховский (А. Н.). Materials for the ecological Characterisation of the Acrididae of the Kuznetzk Steppe.** [*In Russian.*]—*Bull. W. Siber. Plant Prot. Sta.* no. 1 (9) pp. 71–118, 3 tables, 14 refs. Novosibirsk, 1935. [Recd. November 1936.]

An investigation of phyto-ecological characteristics of West Siberian Acridids was made in the years 1925–27, by means of field studies on the distribution of populations, estimated by the method of sweeping, accompanied by a study of vegetation. It was established that the Acridids form associations, each connected with a definite group of phyto-ecological stations. These are described in detail, and the Acridids found on them are enumerated ; in general, the grasshopper associations have more definite limits than the plant associations.

In the Kuznetzk Steppe, Acridids do a great deal of damage, *Stauroderus scalaris*, F. W., *Chorthippus albomarginatus*, DeG., and *Aeropus sibiricus*, L., being the most injurious, while *Pararcyptera microptera*, F. W., *C. apricarius*, L., *C. biguttulus*, L., and *C. bicolor*, Charp., are of secondary importance. All these species are closely connected with virgin steppe and with fallow lands overgrown by *Agropyrum repens* adjoining the cultivated fields. *A. sibiricus* is also found on dry slopes and on grazing grounds.

[Kadzevitch (I. S.).] **Кадзевич (И. С.). Biological Observations on *Chorthippus albomarginatus* De Geer in the Kuznetzk Steppe.** [*In Russian.*]—*Bull. W. Siber. Plant Prot. Sta.* no. 1 (9) pp. 119–136, 4 tables. Novosibirsk, 1935. [Recd. November 1936.]

In the Kuznetzk steppe area, *Chorthippus albomarginatus*, DeG., usually occurs on abandoned fields, overgrown mainly by *Agropyrum repens*. The annual cycle of the grasshopper, its general behaviour in connection with weather, and the processes of hatching, moulting, pairing and egg-laying are discussed, and the eggs, egg-pods and nymphal instars are described. In the field, hatching occurred in the first three weeks of June, and the adults first appeared on 24th June and survived until 19th September. In the laboratory, the average durations of the four successive instars were, respectively, 8 days at 21–25°C. [69·8–77°F.], 8 days at 16–29°C. [60·8–84·2°F.], 10·9 days at 20–25°C. [68–77°F.], and 10·7 days at 21–29°C. [69·8–84·2°F.]. Some hoppers

bred in the cage had an extra instar, occurring between the second and third.

The hoppers do not congregate into bands. The younger ones feed only from 7 to 10 a.m., and 5 to 7 p.m., and pass most of the day on the ground, but the older ones and adults are more active and feed more often. *A. repens*, wheat and other graminaceous plants are readily eaten, as well as dry plant remains and horse-dung. The night is passed on the plants. Both sexes are almost sexually mature on reaching the adult stage, beginning to pair 4–14 days later. The average number of egg-pods laid by one female, usually at intervals of 4 days, was 8·2 in cages and 9·6 in nature. Natural enemies include a roundworm and a red mite, both unnamed.

[Sirazitdinova (F. S.).] **Сиразитдинова (Ф. С.). On the Determination of the Amount of Food consumed by Acrididae.** [*In Russian.*] —*Bull. W. Siber. Plant Prot. Sta.* no. 1 (9) pp. 137–140, 2 refs. Novosibirsk, 1935.

The amounts of food consumed by adults of *Aeropus sibiricus*, L., *Chorthippus albomarginatus*, DeG., *Stauroderus scalaris*, F. W., and *C. apricarius*, L., kept in glass cages and fed on fresh wheat plants, were measured by means of millimetre squared paper [*cf. R.A.E.*, A **21** 52]. In all cases, the amounts eaten in a day varied with the weather, decreasing by 34–50 per cent. on dull, cloudy days, and the females, which devour whole leaves, consumed greater amounts than the males, which eat only the edges of leaves ; the females of *A. sibiricus* and *C. albomarginatus*, respectively, ate 1·8 and 3 times as much daily as the males.

[Berezhkova (A. A.).] **Бережкова (А. А.). A Note on Egg-parasites of Siberian Acrididae.** [*In Russian.*]—*Bull. W. Siber. Plant Prot. Sta.* no. 1 (9) pp. 141–143, 2 refs. Novosibirsk, 1935.

The Proctotrupid parasite of the eggs of *Staudoderus scalaris*, F. W., in the Tomsk region [*R.A.E.*, A **13** 219] has now been determined as *Scelio vulgaris*, Kieff. It is distributed throughout the forest steppe zone of Siberia, from the Bolotninsk region to Irkutsk, and also parasitises the eggs of *Chorthippus albomarginatus*, DeG, and *Aeropus sibiricus*, L.

Larvae of an undetermined Chalcidoid were found in the eggs of *C. albomarginatus* from the Bolotninsk region.

Woo (F. C.) & Cheng (T. S.). **A general Investigation of the Locust Outbreaks in China during the Year 1935.**—*Spec. Publ. nat. agric. Res. Bur. Minist. Industr.* no. 14, 20 pp., 3 figs. Nanking, September 1936. [With a Summary in English.]

In 1935, outbreaks of *Locusta migratoria*, L., occurred in several provinces of central China, while *Ceracris kiangsu*, Tsai, was confined to Hunan. *Locusta* passed through two generations and bred mainly along the sea coast and the banks of rivers and lakes [*cf. R.A.E.*, A **23** 638]. The damage was most severe on wheat, maize and, particularly, reeds, and was estimated at about 290,000 Mexican dollars, or one-fourth as much as in 1934 ; 7,700 dollars were expended on control. There was no improvement with regard to *Ceracris kiangsu*, Tsai, which damaged

reeds to the value of 250,000 dollars, as well as rice and maize, and the control of which cost over 33,000 dollars. A map shows the distribution of both species in China during the year.

UMEYA (Y.) & OMI (Y.). **Studies on noxious Insects on Mulberry Trees in Korea. 1. List of injurious Insects of Mulberry in Korea.** [*In Japanese.*]—*Rep. seric. Exp. Sta. Korea* **3** no. 4 pp. 145–164, 2 pls. Suigen, Korea, December 1935. **2. On** *Angerona aexaria* **Walk.** [*In Japanese.*]—*T.c.* no. 5 pp. 165–196, 2 pls. December 1935. (With a Summary in English.) **3. On** *Paralebeda plagifera* **Walk.** [*In Japanese.*]—*T.c.* no. 6 pp. 197–248, 4 pls., 25 figs. December 1935. (With a Summary in English.) [Recd. December 1936.]

The first paper comprises an annotated list of 118 insects that attack mulberry in Korea, and the second and third deal with the Geometrid, *Angerona aexaria*, Wlk., and the Lasiocampid, *Paralebeda plagifera*, Wlk., all stages of both of which are described in detail. The larvae of *A. aexaria* are commonly found on mulberry, though they cause little damage. There are generally two generations a year, the moths emerging from mid-June to early July and from late August to early September. The larvae of the second generation hibernate in the fifth instar and begin to feed again in early May. Sometimes there is a third generation, but the young larvae die during the winter. Pupation occurs in a loose cocoon on the mulberry tree, and the pupal stage averages 14 days in June and 9 days in August. The moths lay about 500 eggs; they are deposited in masses on the leaves at night, and hatch in 7–10 days. Submergence in water kills the larvae in 5 hours and the pupae in 48. The destruction in the autumn or early spring of grass and fallen leaves, in which the larvae hibernate, is recommended for control.

Paralebeda plagifera is found in the north of Korea and has one generation a year. The moths generally emerge at the end of July and live for about 12 days. The females lay about 400 eggs, which hatch in 10–15 days. The larvae hibernate on the branches of the mulberry trees in the third or fourth instar. Hibernation begins in late October and feeding is resumed at the end of April. The young larvae are gregarious and feed on the leaves all day, but the older ones feed only at night. They pupate in early July in cocoons on the trees, and the moths emerge about 19 days later. Collecting the larvae and moths, the latter by means of light-traps, is recommended.

NUKADA (M). **Extract from Silkworm Pupae ; a useful Substitute for Meat Extract in the Preparation of Bacteriologic Culture Media.**—*Philipp. J. Sci.* **60** no. 1 pp. 11–18, 2 refs. Manila, May 1936. [Recd. November 1936.]

Details are given of experiments on the preparation and use, as culture media for bacteria, of extracts of dead silkworm pupae, a waste product of the silkworm industry. They were found to be in every respect equal and at times superior to the beef extract commonly employed. It is estimated that, in Japan, their use by laboratories engaged in the preparation of typhoid or cholera vaccines on a large scale would reduce the cost of culture media by about 75 per cent.

SHARPLES (A.). **Diseases and Pests of the Rubber Tree.**—Demy 8vo, xvii+480 pp., 4 col. pls., 70 figs., many refs. London, Macmillan & Co. Ltd., 1936. Price 25*s*.

This book, the greater part of which deals with the diseases of rubber (*Hevea*), is divided into three parts, the last of which includes a section (pp. 369–414) on injurious insects and mites, with particular reference to Malaya. Of the 18 species dealt with, the only ones considered of major importance are the termite, *Coptotermes curvignathus*, Hlmgr., and possibly the Melolonthid, *Psilopholis grandis*, Lap., which are both discussed at some length.

GEORGI (C. D. V.) & GUNN LAY TEIK. **Notes on the Preparation of Derris Root for Export together with a Suggested Method for Evaluation.**—*Malay. agric. J.* **24** no. 10 pp. 489–502, 4 refs., 1 diagr. Kuala Lumpur, October 1936.

In addition to giving notes on the harvesting and sampling for analysis of roots of *Derris* in Malaya, the authors describe a method for determining the rotenone content, which is based on one previously noticed [*R.A.E.*, A **21** 572], the chief difference being that trituration of the crude carbon tetrachloride complex with cold alcohol has replaced recrystallisation from boiling alcohol. This method gave results in close agreement.

Samples of *D. elliptica* (Singapore type) from a locality near Singapore, yielded 5–6 per cent. rotenone, and 18–22 per cent. ether extract. These satisfy the market requirements of 4–5 per cent. rotenone, or 18 per cent. ether extract if sold on that basis. The latter standard is also reached by roots of *D. malaccensis* (Kinta type), which, though free from rotenone, yield about 18 per cent. ether extract.

CORBETT (G. H.) & HASSAN (Abu). **Two Insects of the Vanda Joaquim Orchid Flower.**—*M.A.H.A. Magazine* **6** no. 4. October 1936. (Abstr. in *Malay. agric. J.* **24** no. 10 p. 506. Kuala Lumpur, October 1936.)

Notes are given on the bionomics and control of *Anaphothrips corbetti*, Priesn., and the Criocerid, *Lema pectoralis*, Baly, which are associated with the flowers of the Vanda Joaquim orchid in Malaya. All stages of the beetle are briefly described, and notes are given on its life-history and that of a larval parasite. Hand-collection is recommended for its control. *A. corbetti*, which has only recently been associated with the orchid, is not found in gardens where derris is regularly used, and may be controlled with sprays of soap, derris or nicotine sulphate.

RAU (S. Ananda). **Report of the Entomologist.**—*Rep. Tea Dep. U.P.A.S.I. 1935–36* pp. 35–45. Madras, 1936.

Further studies were made during 1935–36 on *Helopeltis* infesting tea in south India [*R.A.E.*, A **24** 39], from which it appears that its behaviour in south Travancore does not materially differ from that reported in central Travancore. No serious outbreaks of nettle-grubs [Limacodids] occurred on tea during the year. A further species of *Thosea*, at present unidentified, was observed. Parasites included the Ichneumonid, *Goryphus* sp., on *Spatulifimbria grisea*, Hering, the

Eulophid, *Euplectrus* sp., on *Narosa conspersa*, Wlk., and the Braconid, *Fornicia ceylonica*, Wlksn., on *Thosea cervina*, Moore. Other natural enemies of *T. cervina* were the nymphs and adults of *Cantheconidea* (*Canthecona*) *furcellata*, Wolff, which were predacious on the larvae, and the fungus, *Cordyceps pruinosa*, which attacked the cocoons. Investigations on termites showed that living tea bushes are attacked by *Coptotermes* sp. and an undescribed species of *Calotermes* resembling *C. dilatatus*, Bugnion and Popoff. Injury by the tea aphis, *Toxoptera aurantii*, Boy., remained confined to nurseries and tea that had recently been pruned. A Coccinellid, *Chilomenes sexmaculata*, F., the Syrphids, *Paragus atratus*, de Meij., *P. serratus*, F., and *Syrphus adligatus*, Wied., and an unidentified Hemerobiid prey on the Aphids, while a Braconid of the genus *Trioxys* is parasitic on them. Sprays containing nicotine appear to give a good control. Notwithstanding earlier opinions to the contrary, it is now established that the shot-hole borer, *Xyleborus fornicatus*, Eichh., occurs on tea in south India, even if in only small numbers.

Serious injury to tea over an area of about 350 acres in south Travancore was caused by a Geometrid tentatively identified as *Boarmia* (*Ectropis*) *bhurmitra*, Wlk., all stages of which are briefly described. The larvae were abundant from October to January, and some could be found up to April. The older leaves were first destroyed, the young leaves later, and ultimately even the bark was attacked. The eggs were laid in masses of up to 425 in crevices of the bark of *Grevillea*, rubber, *Gliricidia* and probably other trees, but not on tea. The pupae occurred just below the surface of the ground, and the adult moths were sluggish, resting on *Grevillea* trunks during the day, up to a height of 20 ft. or more. This Geometrid appears to be a dry-weather pest ; it is not known how it passes the period from April to October. Other food-plants were *Grevillea* and *Gliricidia*, preferably the former, but rubber, though favoured for oviposition, was not attacked. Various measures of control are discussed, and it is concluded that collection of the pupae and moths by hand is the most practicable. A few unidentified parasites and predators were observed. Other pests observed on tea included *Indarbela* sp., which caused serious damage to bushes weakened by various causes ; *Ereboenis saturata*, Meyr. [**23** 639], which has now been found in south, as well as central, Travancore ; and the Coccids, *Saissetia coffeae*, Wlk. (*Lecanium hemisphaericum*, Targ.), *Ceroplastes* sp., *Aspidiotus destructor*, Sign., and *A. rapax*, Comst. (*camelliae*, Sign.). Thysanoptera were not in evidence on tea in 1935–36. The species attacking tea flowers in south India is now known to be *Thrips florum*, Schmutz, and those that occur on the leaves are *Heliothrips haemorrhoidalis*, Bch., *Scirtothrips* spp., *Thrips* sp. and *Neoheegeria* sp.

Among pests of shade trees, *Terias hecabe*, L., on *Albizzia*, was checked by unidentified parasites, the rate of parasitism being over 80 per cent. The most important pest of *Grevillea* was *Pagiophloeus umbricidus*, Mshl., the larvae of which bore in the wood below the bark. Trees less than two or more than five years old are immune from attack. This weevil has only been observed during the second half of the year. It is presumed that oviposition takes place from October to December, in the axils or forks of branches, as attack is mostly confined to these regions. The larvae pupate in their burrows, and the adults emerge from September to December. Other borers attacking *Grevillea* include *Xyleborus semigranosus*, Bldfd. and *Platypus latifinis*, Wlk.

Young plants of *Acacia decurrens* were reported to have been defoliated by the weevil, *Myllocerus subfasciatus*, Guér., which has not previously been observed on *Acacia*.

Voss (E.). **Ueber unbeschriebene Curculioniden der palaearktischen Region (Col., Curc.). (61. Beitrag zur Kenntnis der Curculioniden.)** [On undescribed Curculionids of the palaearctic Region. 61st Contribution to the Knowledge of Curculionids.]—*Mitt. dtsch. ent. Ges.* **7** no. 4–5 pp. 55–61, 2 figs. Berlin, November 1936.

The weevils described include *Pseudypera subtessellata*, gen. et sp. n., and *P. steineri*, sp.n., from Turkey. The former is injurious to poppies and the latter to rape.

Morris (H. M.). **Annual Report of the Entomologist for 1935.**—*Rep. Dep. Agric. Cyprus 1935* pp. 49–56. Nicosia, 1936.

During 1935, 12,395 *Citrus* trees and 223 beds of seedlings were fumigated with hydrocyanic acid gas against *Lepidosaphes beckii*, Newm., in a small area of Cyprus known to be infested [*R.A.E.*, A **23** 708], some 3,000 trees remaining untreated. White oil emulsions were again used on *Citrus* against *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., and proved less costly but also less effective than fumigation. An examination of *Citrus* plants that had been imported in 1934 [*cf. loc. cit.*] revealed the presence of *Icerya purchasi*, Mask, and *Ceroplastes floridensis*, Comst., where they had not been found in that year, but none was found on fumigated plants. *I. purchasi* and *Saissetia oleae*, Bern., were intercepted on *Citrus* seedlings from Palestine.

Dociostaurus maroccanus, Thnb., occurred in greater numbers than in 1934 but, like *Tettigonia viridissima*, L., and *Calliptamus italicus*, L., was not abundant. A study of *Asphondylia gennadii*, Marchal, which prevents the normal development of pods of carob [*Ceratonia siliqua*], showed that, in addition to the early summer brood of adults, there were at least 2 broods in the newly formed pods in late summer and autumn, and that the Cecidomyiid passes the winter in the pods as a small and slowly developing larva. It is not known where the summer is passed, but probably the last adults of the spring generation emerge late enough to oviposit on the earliest newly formed pods in July. At an altitude of 1,200–1,500 ft., adults emerged a month later than near the coast in the same locality. *A. gennadii* is generally distributed over the carob-growing areas of the Island, but there is considerable and unexplained variation in intensity of attack. It was parasitised to a considerable extent by the Chalcidoids, *Pseudocatolaccus asphondyliae*, Masi, *Tetrastichus flavovarius*, Nees, and *Eurytoma dentata*, Mayr. It apparently attacks unfertilised pods as readily as fertilised ones, but the former, when infested, remain on the tree and grow misshapen in the same way as infested fertilised pods, so that the number of dwarfed pods on the trees in spring and autumn does not indicate the extent of loss through infestation. Among other pests not mentioned in the last report [*loc. cit.*] are *Dolycoris baccarum*, L., against which a campaign was necessary for the first time since 1931, as it was present in large numbers on summer vegetable crops ; *Recurvaria nanella*, Hb., which caused considerable damage to the buds of apricot trees ; and *Vanessa* (*Pyrameis*) *cardui*, L., which was abundant on artichokes and wild

plants and also attacked melons, and against the younger larvae of which nicotine sulphate sprays were successfully used.

A Government Order issued on 14th August 1935 requires all *Citrus* trees in areas declared to be infested with *Lepidosaphes beckii* to be fumigated as directed by the Director of Agriculture, and prohibits the movement of *Citrus* plants or fruit within such areas without permission.

Pussard (R.). **Le bupreste des arbres fruitiers** (*Capnodis tenebrionis*).—*Rapp. Congr. Arbres fruit. Nice 21 Jan. 1935.* 8 pp., 6 figs., 4 refs. Nice, 1935. [Recd. November 1936.]

In this paper, the author summarises previous work by himself and others on the bionomics and control of *Capnodis tenebrionis*, L., attacking stone-fruit trees in the south of France [*R.A.E.*, A **22** 714; **23** 141, 230, 353]. Contrary to observations by Balachowsky, adults were found throughout the year. Larval development extended over a period of 2 years.

Balachowsky (A.). *Labidostomis lucida* **Germ. nuisible au cerisier dans le département de l'Yonne.**—*Bull. Soc. ent. Fr.* **41** no. 15 pp. 251–252, 5 refs. Paris, 1936.

Records are cited from the literature of injury to fruit trees and other cultivated plants in the Mediterranean region by Clytrids, only the adults of which are pests. A serious outbreak of *Labidostomis lucida*, Germ., occurred in the cherry orchards of north-central France at the beginning of June 1936. As is characteristic with Clytrids, infestation began and ended suddenly, lasting only a week, during which time all the young shoots were attacked. This species, which has also been recorded on vine, is the only member of its genus known to be injurious to cultivated plants in France, where 30 Clytrids occur, chiefly in the south, but rarely assume economic importance.

Paillot (A.). **Nouvelles observations sur la biologie du carpocapse et sur les traitements insecticides et fongicides des poiriers et pommiers.**—*C. R. Acad. Agric. Fr.* **22** no. 25 pp. 867–870, 1 ref. Paris, 1936.

In the district round Lyons in 1936, nearly half the larvae of the codling moth [*Cydia pomonella*, L.] had pupated on 1st April, when pupation is usually only beginning, but emergence of adults and oviposition were not observed before 15th May and early June, respectively. In 1934, pupation took place much later, but oviposition began before 15th May and the first larvae hatched during the same month. In 1936, adults of the overwintered generation were still to be seen at the beginning of July. First-generation adults began emerging on 23rd July in cages in which infested apples and pears had been placed 3 weeks before, and continued to do so until the beginning of August, when 70 per cent. of the larvae had given rise to moths. Cocoons were first observed under corrugated cardboard bands on apple trees on 20th July; and on 7th August, 30 per cent. of the larvae under them had pupated or produced adults, but empty pupal cases on the trunk and larger branches suggested that the bands are more attractive to hibernating larvae than others and that the actual proportion of first-generation larvae that hibernates is much less than 70 per

cent. The second generation is at least as important as the first, and in 1934 and 1935 infested, in many cases, 70 or 90 per cent. of the fruit on late varieties of pear.

Two sprays of lead arsenate (5 lb. to 100 gals. Bordeaux mixture) are recommended for this region, the first applied at petal-fall and the second towards the end of May, when the first larvae are hatching. In one orchard thus treated only 1–2 per cent. of the pears were infested on 7th August. Fruits sprayed on 8th April 1936 retained enough residue (5 mgm. arsenic and 16 mgm. lead per 100 gm. fresh fruit) to kill newly hatched larvae on 15th May. It is important to fill the calyx cup with spray. In another pear orchard these sprays were supplemented by the application, in the middle of June, of an emulsion of ground-nut oil with lead arsenate, casein, and nicotine. This was found to kill the eggs of *Cydia*, and the loss of late pears was only 0·1 per cent.

Pussard (R.). **Les méthodes de lutte contre les principaux ravageurs des arbres fruitiers.**—*Conf. 29 Déc. 1935 Soc. cent. Agric. Nice.* 8 pp. Nice [1936].

Spray programmes are given for the treatment of apples and pears, peaches, cherries and apricots, figs, and *Citrus*, against insects and fungi in France, with notes on the insecticides and fungicides employed.

Artigala (J.). **Quelques ennemis des artichauts.**—*Rev. maroc. Fruits Prim. Afr. N.* **6** no. 68 pp. 277–278. Casablanca, October 1936.

Insects liable to attack globe artichokes in the extreme south of France include *Depressaria subpropinquella*, Staint., which seriously affects the growth of the plants, beginning to attack them in late March or April, and is also found on all species of thistle and on burdock [*Arctium*], and *Vanessa cardui*, L., which occurs only occasionally in large numbers though it has two, or sometimes three, generations a year. The larvae of both these insects can be controlled by a spray containing nicotine sulphate, soap and 1 per cent. denatured alcohol, applied as soon as they appear on the leaves, or by a dust containing 20 per cent. barium fluosilicate. The larvae of *Apion carduorum*, Kby., and of *Agromyza apfelbecki*, Strobl (*andalusiaca*, Strobl) mine in the stems and veins of the leaves, and those of the Noctuid, *Hydroecia xanthenes*, Germ., eat into the stems, arresting growth. The only effective method of control for these three pests is to cut and burn the infested parts of the plants. The adults of *Hydroecia* occur in autumn, when they may be caught by means of light-traps.

Bua (G.). **Un quinquennio di osservazioni bio-ambientali sulla mosca delle olive.** [A Quinquennium of bio-environmental Observations on the Olive Fly.]—*Meteorol. prat.* **17** no. 3, reprint 15 pp. Perugia, 1936.

Investigations on the olive fly, *Dacus* [*oleae*, Gmel.], made during 1931–35 in the province of Salerno are summarised. Some of the work in 1931–33 has already been noticed [*R.A.E.*, A **22** 365, 508, etc.]. The data obtained are not considered sufficient to warrant definite conclusions regarding the effect of meteorological conditions on the development of the fly, but in years of maximum infestation there were abundant, well distributed rains in summer, average temperatures below 24°C. [75·2°F.], maximum temperatures not higher than

32–34°C. [89·6–93·2°F.], and a low percentage of parasitism early in summer. In years of slight infestation the weather was dry and hot and there was a high percentage of parasitism early in summer. A temporary reduction in infestation observed in all years in August and September appears due to the great activity of parasites at that period, to the dry weather and to the pulp of the olives being in a condition less suitable for the larvae. At altitudes of about 700 and 1,700 ft., where the infestation began very late this reduction did not occur. The actual infestation was less at these altitudes, evidently owing to the lower temperature, which at about 1,700 ft. probably reduces the number of generations a year. The parasites observed during the five years were *Eurytoma rosae*, Nees, *Eulophus longulus*, Zett., and *Eupelmus urozonus*, Dalm., which last was the most abundant and also a hyperparasite, as Silvestri found it parasitising the larvae of both the other species.

Pussard (R.). **Les ravageurs du cyclamen.**—4 pp., 1 fig. Nice, 1936.

This paper, which is partly compiled from the literature, comprises brief notes on the fungi, Arthropods and Nematodes that attack *Cyclamen* in France and neighbouring countries. The insects include polyphagous Lepidoptera and thrips and the weevils, *Otiorrhynchus sulcatus*, F., and *O. rugosostriatus*, Goeze, which were observed by the author attacking *Cyclamen* in the south of France.

Sjöberg (K.). **Studier och försök rörande vetemyggorna** *Contarinia tritici* **Kirby och** *Clinodiplosis mosellana* **Géh. samt deras bekämpande. II. Laboratorieförsök för bekämpning av larverna med kemiska medel.** [Studies on the Wheat Gall-midges, *C. tritici* and *Sitodiplosis mosellana*, and their Control. II. Laboratory Experiments for Control of the Larvae by Chemical Means.]—*Medd. Växtskyddsanst.* no. **13** 22 pp., 6 refs. Stockholm, 1936.

Mühlow (J.). **III. Fältförsök för bekämpning av larverna med kemiska medel.** [III. Field Experiments for Control of the Larvae by Chemical Means.]—*Op. cit.* no. **14** 30 pp., 3 figs., 15 refs. Stockholm, 1936. (With Summaries in German.)

These two papers deal with tests in Sweden in 1932–35 of soil treatments designed to kill the overwintering larvae of the wheat gall-midges, *Contarinia tritici*, Kby., and *Sitodiplosis* (*Clinodiplosis*) *mosellana*, Géh. [*cf. R.A.E.*, A **23** 625], in their cocoons. The experiments were made on *C. tritici*, which is more numerous than *S. mosellana*. For the laboratory tests described in the first paper, cocoons collected from infested fields were placed in suitable earth or sand in glass jars, each jar containing about 50, at a temperature of 0–10°C. [32–50°F.]. Various dusts or liquids were applied to the surface of the earth, and at definite periods cocoons were restored to room-temperature and examined for mortality. The results of the various trials are tabulated. Of the many chemicals tried, the only ones that showed promise were potassium cyanide and a group of arsenicals (arsenic trichloride, arsenic trioxide and sodium arsenite), both applied in water, and calcium cyanamide. Arsenic trichloride partly decomposes in water, yielding hydrochloric acid and arsenic acid, which latter forms an aqueous solution containing some chloride in proportion to the excess of hydrochloric acid, the solution at the same time becoming more acid and therefore more erosive. Arsenic trioxide, which is almost insoluble in

water, was dissolved by the addition of dilute hydrochloric acid, the resulting changes releasing some free arsenic, the amount of which is dependent on the nature of the soil. A subsidiary experiment showed that beets and cereals grew normally in soil treated with arsenicals, and their arsenic content at harvest was less than twice that of plants grown in untreated soil, so that treatment would involve no risk of poisoning. The control exercised by these substances varied greatly in the different tests, the cause of this possibly being the nature of the soil, the time at which the tests were made and the special susceptibilities of the larvae. The author's recommendations include the use of potassium cyanide at the rate of 0·03–0·06 oz. per sq. yd., but calcium cyanamide is preferable on account of its non-poisonous nature and its value as a fertiliser.

In the second paper, an account is given of field experiments and reference is made to similar work in Germany [**23** 123, etc.]. Experiments were to some extent based on this and on the laboratory results noted above, and were carried out on plots containing over 9,000 larvae per sq. ft. The effectiveness of the preparations used was tested by means of boxes of two types placed on the ground, which collected the midges as they emerged [**23** 124]. The results, which are tabulated, were somewhat uncertain, but bleaching powder [calcium oxychloride], kainit, calcium oxide and calcium cyanamide, which latter also proved effective in the laboratory, gave some control. The best percentage controls obtained with the different materials were 43 with bleaching powder (at the rate of 180 lb. per acre), 59 with calcium oxide (1,800 lb.), 33 with kainit (900 lb.) and 75 with calcium cyanamide (270 lb.). As both kainit and bleaching powder are too expensive for economic use, the author recommends the use of calcium cyanamide, which, as above mentioned, is of value as a fertiliser, although excessive or late application may reduce the yield of certain crops.

Kotte (W.). **Pflanzenschutz im Maisbau.** [Plant Protection in Maize Cultivation.]—*Kranke Pflanze* **13** no. 11 pp. 193–196, 1 pl. Dresden, November 1936.

In view of the increase in the cultivation of maize in Germany, a brief account is given of the fungus, *Ustilago zeae*, and of the maize Pyralid [*Pyrausta nubilalis*, Hb.], which are common in south-western Germany [*cf. R.A.E.*, A **23** 392].

Langenbuch (R.). **Bericht des Kartoffelkäfer-Abwehrdienstes, Heidelberg.** [Report of the Potato Beetle Defence Service at Heidelberg.]—*NachrBl. dtsch. PflSchDienst* **16** no. 11 pp. 105–108, 6 figs. Berlin, November 1936.

In this second part of a report on the Heidelberg defence service against *Leptinotarsa decemlineata*, Say [*R.A.E.*, A **24** 798], an account is given of the measures employed, namely collection, sifting of the soil, soil fumigation with carbon bisulphide, and spraying the potato plants with lead arsenate.

Zacher (F.). **Beitrag zur Nährpflanzenkenntnis der Samenkäfer (Col. Bruch.-Lariidae).** [Contribution to a Knowledge of the Foodplants of the Beetles attacking Seeds.]—*Mitt. dtsch. ent Ges.* **7** no. 1 pp. 10–13. Berlin, April 1936. [Recd. November 1936.]

This is a list of Bruchids collected by the author or sent to him, showing the seeds from which they were obtained. The European

species are *Bruchus brachialis*, Fhs., and *B. pallidicornis*, Boh., from lentils (*Ervum lens*) ; *B. pisorum*, L., from *Vicia* spp., and *Lathyrus sativus* ; *B. rufimanus*, Boh., and *B. tristis*, Boh., from *L. sativus* ; *B. affinis*, Fröl., from *Vicia*, *Lathyrus*, *Dolichos lablab* and *Cajanus indicus* ; *B. rufipes*, Hbst., and *B. luteicornis*, Ill., from *Vicia* spp. ; *B. discipennis*, Fhs., from wild yellow lupin ; *Bruchus* (*Bruchidius*) *villosus*, F., from *Sarothamnus scoparius*, *Laburnum anagyroides* and *Spartium junceum* ; and *B.* (*B.*) *lividimanus*, Gyll., from *Sarothamnus scoparius*. The Asiatic species are *Pachymerus* (*Caryedon*) *notativentris*, Pic, from *Acacia arabica*, *Arachis hypogaea* and *Cassia fistula* ; *Bruchus* (*Callosobruchus*) *glaber*, Allib., from *Cicer aerietinum* ; *B. sinensis*, Pic, from *Gleditsia* ; and *B. affinis* from *Lathyrus*, *D. lablab* and *Cajanus indicus*. The African species are *Pachymerus* (*Caryedon*) *pallidus*, Ol., from *Cassia acutifolia* ; *Pseudopachymerus lallemanti*, Mars., *Pachymerus albonotatus*, Pic, *B. baudoni*, Caillol, *B. curvithorax*, Pic, *B. submaculatus*, Fhs., *B. silaceus*, Fhs., *B. spadiceus*, Fhs., *B. petechialis*, Gyll., and *B. zacheri*, Pic, all from *Acacia* spp. ; *B. longipennis*, Pic, from *Acacia* and *Prosopis* ; and *B.* (*Callosobruchus*) *quadrimaculatus*, F., from peas. The American species are *Pachymerus bactris*, L., from *Bactris* sp. and *Cocos campestris* ; *Pseudopachymerus grammicus*, Gyll., and *P. lallemanti* from *Acacia* spp. ; *Phelomerus lineola*, Chevr., and *Bruchus leucopygius*, Perty, from *Cassia* spp. ; *B. subroseus*, Motsch., from *Cajanus indicus* ; *B. dominicanus*, Jekel, from *Caesalpinia coriaria* ; and *B.* (*Acanthoscelides*) *obtectus*, Say, which is a native of South America though now occurring in all warm countries, from beans (*Phaseolus*).

Stichel (W.). **Kleine heteropterologische Mitteilungen.** [Small Heteropterological Communications.]—*Mitt. dtsch. ent. Ges.* **7** no. 3 pp. 43–47, 1 ref. Berlin, September 1936.

These short notes include one on *Eurydema dominulus*, Scop., recorded from Germany as a serious pest of *Aubrietia* and *Arabis* in gardens.

Fidler (J. H.). **On the First Instar Larvae of some Species of *Otiorrhynchus* found on Strawberries, with Notes on their Biology.**—*Bull. ent. Res.* **27** pt. 3 pp. 369–376, 4 figs., 11 refs. London, September 1936.

Descriptions, based on material collected in England, are given of the morphology of the first-instar larvae of *Otiorrhynchus sulcatus*, F., *O. rugosostriatus*, Goeze, *O. ovatus*, L., and *O. rugifrons*, Gyll., the larvae and adults of which attack strawberries (*O. rugifrons* less frequently than the others). The points dealt with are those by which the first-instar larvae differ either from each other or from the more mature larvae as described by Keifer [*R.A.E.*, A **21** 648]. A survey of the bionomics of these weevils is appended, compiled from the author's observations and from the literature.

All the species seem to be parthenogenetic, no males having apparently been recorded. The adults usually emerge from the soil about the end of April or in May, but in British Columbia [**1** 93] *O. ovatus* does not usually appear until early July. Oviposition begins about 7–10 days after emergence, and while estimates of the number of eggs laid by *O. sulcatus* appear to vary [**15** 256 ; **19** 373], *O. ovatus* is said to lay an

average of 50 eggs [**1** 93], and the single female of this species kept in captivity by the author laid fewer still. Most eggs are laid in the soil near the surface, but *O. ovatus* and *O. rugosostriatus* placed some on the petioles of leaves when near the soil, or even on the crown in strawberries. The larvae hatch in about 3 weeks, and probably feed on humus for the first few days. They usually feed readily on the roots or leaves, and *O. rugifrons* mined the leaves of saxifrage on which the eggs were laid [**14** 23]. The author has observed the other three species mining the leaves of cyclamen where they touch the soil. The foodplants of these larvae include cyclamen, primula and saxifrage in greenhouses, and strawberries, raspberries and, in the case of *O. sulcatus* and *O. ovatus*, forest plants in the open. Some authors consider that the race of *O. ovatus* that attacks forest plants is biologically distinct, as it will not feed on strawberries, nor will the strawberry race feed on forest plants. The larvae pass the winter in the soil, generally in an advanced stage of development. In most cases, pupation occurs in April or May and the pupal stage lasts about 3 weeks, but the adult remains in the pupal cell for at least 5–7 days, or for some weeks if weather conditions are unfavourable. In the case of *O. sulcatus* and *O. ovatus*, pupation may be postponed until the autumn, the winter being then passed in the adult stage. Adults of *O. ovatus*, *O. sulcatus* and *O. rugosostriatus* were found hibernating in the rubbish under the hedges near the strawberries on which they had been feeding in the summer. The hibernating adults emerge earlier than those from the spring pupae, and start to lay eggs in March or April. About 68 per cent. of these eggs are fertile compared with 80 per cent. of those laid in the autumn.

Bogush (P. P.). **Some Results of a Study of Insects by Means of Light Traps in Central Asia.**—*Bull. ent. Res.* **27** pt. 3 pp. 377–380, 4 figs. London, September 1936.

Light-traps have been in use in Turkmenistan since 1930, and up to 150,000 insects have been caught in a single night in a trap equipped with a 500-watt light. An outline is given of the ways in which data of various kinds were obtained by means of the traps.

Adults of *Laphygma exigua*, Hb., which is a cotton pest in Turkmenistan, were shown to be present from spring to autumn, although few were obtained by other methods. In May 1933, a flight of the moths from adjacent waste lands was detected, but examination showed that many had already oviposited, and further oviposition was insignificant. During 1930, *Loxostege sticticalis*, L., and *Pyrausta nubilalis*, Hb., were taken for the first time at Bairam-Ali (southern Turkmenistan), and *Gryllotalpa africana*, P. de B., for the first time in Central Asia. In 1932, an undescribed species of *Earias* and *E. turana*, Grote, both of which were later shown to be associated with *Salix*, were taken in the trap, and the southern limits of many insects were determined. Data given by the trap indicated that *Loxostege sticticalis* has not less than four generations a year in Turkmenistan, the three summer ones each completing their development in about 40 days. *Euxoa* (*Agrotis*) *segetum*, Schiff., has up to four generations and development takes about 55 days. *Feltia exclamationis*, L., has only two generations, the first of which occupies 85–90 days. In 1931, only 5 individuals of *E. segetum* were caught on 5 nights in April; in 1934, when the catch increased to 17 individuals, a more serious infestation was forecast 2 months before it occurred. The small numbers of this moth trapped

is probably due to its slight positive phototropism. Survival values of different generations were also calculated, by comparing the actual flight with that estimated theoretically. In 1930, the survival of the second generation of *Laphygma exigua* was 0·14 per cent., and of the third 0·07 per cent. For the maintenance of the species under Central Asiatic conditions, a high oviposition rate is necessary (up to 2,000 eggs per female in comparison with 500 eggs under Astrakhan conditions), so that even a slight increase in the percentage survival can cause an outbreak to occur. When data are taken over a series of years, it is possible to show a relation between the size of the brood and climatic conditions. There is a distinct positive correlation for *L. exigua* between the numbers attracted by light at Bairam-Ali and the area treated for its control over the whole of Turkmenistan, and a negative correlation between these two and the mean temperature at Bairam-Ali in December. With *E. segetum* there is a close positive correlation between the number of moths caught in the spring and the extent of the treated area, and also a positive correlation between these two and the mean temperature in December. Thus the outbreaks of *L. exigua* and *E. segetum* may be forecast approximately 5 months before their occurrence. It is hoped to use the traps as a control measure for some pests, particularly the Cerambycid, *Aeolesthes sarta*, Solsky, which attacks trees. The high temperature, light winds and relative stability of the weather during the vegetation period in Turkmenistan would increase their value for this purpose.

Squire (F. A.). **Observations on the Pupal Respiration of some Insects of economic Importance.** —*Bull. ent. Res.* **27** pt. 3 pp. 381–384, 2 figs. London, September 1936.

Experiments, the technique of which is described, were carried out in British Guiana on the respiration of the pupae of some economic insects, in connection with possible modifications in methods of packing pupae of beneficial insects for transport. If the weight of carbon dioxide given off during one hour on successive days of the pupal period was plotted against the period, the curves obtained were roughly parabolic in form. *Pyrrhopyge amyclas*, Cram., *Brassolis sophorae*, L., *Utetheisa ornatrix*, L., *Diatraea saccharalis*, L., and *Metagonistylum minense*, Tns., all gave curves of this form, showing a gradual decline in the rate of respiration during the first half of the period, followed by a similar increase in the latter half, although generally not up to the initial rate. This indicates that the periods of greatest physiological activity occur at the beginning and the end of the prepupal-pupal stage. Dissection of pupae of all ages of *B. sophorae* showed that in pupae one day old practically all the larval organs had disappeared, so that great histological activity must have occurred during the short prepupal stage of 1–2 days. In the case of *Hydrous smaragdinus*, Brullé, the respiratory rate increased continuously throughout the six days of the pupal period. This water beetle has an unusually long prepupal period of 5 days, during which most of the histological changes must take place, since at the time of pupation all the parts of the adult are quite evident. In each brood of *Papilio anchisiades*, Esp., some individuals undergo a marked pupal diapause. In these cases there is a typical obtect pupa respiration curve (a steady decline for the first half of the stage followed by a rise) and on the last days of the normal pupal period the rate of respiration drops almost to zero, where it remains for

the whole of the diapause, which may last 2–100 days. At the end of the diapause, the rate of respiration again increases and visible changes occur in the pupa. In all cases the weight of the pupae decreased by approximately the same amount each day. This loss of weight appeared to be due to loss of moisture and was not in quantitative agreement with the weight of carbon dioxide given off; it was not, however, caused by the dry atmosphere of the experiment, as other pupae gave the same results.

WILKINSON (D. S.). **On two Braconids (Hym.) bred from economic Hosts.**—*Bull. ent. Res.* **27** pt. 3 pp. 385–388, 2 figs. London, September 1936.

Descriptions are given of both sexes of *Mirax leucopterae*, sp. n., reared from *Leucoptera* sp. on *Cromaspora africana* and *L. daricella*, Meyr., on *Pavetta ternifolia* in Tanganyika, and *Fornicia chalcoscelidis*, sp. n., from *Chalcocelis albiguttata*, Sn., in Malaya. A list is appended of the species of *Fornicia* showing those with a unidentate and those with a bidentate scutellum.

THOMPSON (H. W.) & JOHNSON (L. R.). **On the Control of Household Ants.**—*Bull. ent. Res.* **27** pt. 3 pp. 393–397, 1 fig., 6 refs. London, September 1936.

The control of ants invading houses is discussed, with special reference to *Monomorium pharaonis*, L., and *Lasius* (*Acanthomyops*) *niger*, L. The nests of *M. pharaonis* are found in heated premises, generally near kitchen ranges, boilers, etc., where their destruction would involve considerable structural alterations. A colony that remains unchecked rapidly renders the premises uninhabitable through contamination of foodstuffs, and the ants are so small that it is difficult to exclude them even from tightly closed containers. The authors have frequently observed cases in which cakes stored in tins and wrapped chocolates in boxes have been rendered unfit for consumption. The ants are not exterminated by trapping in sponges soaked in syrup, although the numbers of workers have been considerably reduced. In several cases of severe infestation in Britain, the authors have obtained complete control by the use of a bait containing thallium sulphate and syrup [*R.A.E.*, A **15** 71] in containers made from pill-boxes [**18** 486]. The bait was placed near the nest. This method was also effective against *L. niger*. In one case the cost of boxes and materials was estimated at half-a-crown.

KEY (K. H. L.). **Experimental Studies on Locomotor Activity in *Locusta migratoria migratorioides* R. & F.**—*Bull. ent. Res.* **27** pt. 3 pp. 399–422, 6 figs., 14 refs. London, September 1936.

Spontaneous locomotor activity in hoppers of *Locusta migratoria migratorioides*, R. & F., was studied in order to provide a basis for comparing the activities of isolated and crowded individuals. All the material used was kept at a constant temperature of 27°C. [80·6°F.] and relative humidities of 5–10 per cent., rising once a day to 50 per cent., or of 99–100 per cent. The apparatus in which the observations were made, and which ensured constant conditions of temperature, light and either low or high relative humidity, is described in detail.

The rate of activity was measured by tracing the path of the hopper on a copy of a chart over which it was crawling, and expressed in centimetres per minute. An analysis is made of the distribution of different degrees of activity among the records ; it shows that activity was very variable but that approximately 69·9 per cent. of the records referred to the rate of 0–5 cm. per minute, 14 to 5–10 cm., 9·2 to 10–15 cm., 3·1 to 15–20 cm., 1·8 to 20–25 cm., 1·2 to 25–30 cm., and 0·6 to 30–35 cm. Hoppers reared in a dry atmosphere were less active than those reared in humid conditions. The differences in the relative humidity obtained during the actual observation had little effect on activity, but in general the first and second instars were more active in the wet atmosphere, while the third, fourth and fifth instars were more active when placed in an atmosphere different from that in which they had been reared, whether dry or moist. The males were more active than the females. The fact that hoppers of all instars travelled about the same distance in the same time, in spite of the differences in their sizes, suggests that, since all activity was spontaneous, they must have a higher rate of automatic nervous discharge in the earlier instars.

The underlying causes of activity are discussed, and it is concluded that external stimulation is the most potent factor in influencing the amount of activity exhibited, and as such must be the crucial factor in producing the swarming phase. Previous environmental conditions, especially those of stimulation, modify activity by influencing nervous excitability ; thus observations on isolated hoppers of ph. *gregaria* suggested that they showed a higher degree of spontaneous activity than ph. *solitaria*.

PERKINS (J. F.). **On a new Species of** *Nemeritis* **bred from the Bee-hole Borer of Teak (Hym. Ichn.).**—*Bull. ent. Res.* **27** pt. 3 pp. 431–433. London, September 1936.

Both sexes of the Ichneumonid, *Nemeritis tectonae*, sp. n., reared from *Xyleutes ceramicus*, Wlk. (bee-hole borer) attacking teak (*Tectona grandis*) in Burma, are described, and notes on its life-history are given by D. J. Atkinson. In March 1934, 28 trees were examined, and 35·8 per cent. of the bee-holes contained cocoons of the parasite from which the adults had emerged. All these bee-holes were 1½–2 ins. long or about the size of those that would contain normal unparasitised larvae about 4 months old. The larvae of *Xyleutes* hatch from late April till July in this district, and there is little overlapping of larval instars. In August, 5 living parasite pupae were taken, from which one adult emerged on 29th October, while the remainder succumbed to mould. For parasites emerging in August, few *Xyleutes* larvae suitable for oviposition are available, and it appears that the period from then until the following May must be passed in some alternate host [*cf. R.A.E.*, A **24** 241]. Search for this host has not so far been successful.

MILES (H. W.). **On the Biology of** *Emphytus cinctus*, **L., and** *Blennocampa waldheimi*, **Gimm. (Hym., Symphyta).**—*Bull. ent. Res.* **27** pt. 3 pp. 467–473, 2 pls., 2 figs., 11 refs. London, September 1936.

Emphytus cinctus, L., has been recorded as causing injury to the foliage of rose and strawberry in various parts of Britain, and has also

been observed on raspberry. The adults are active in bright sunlight, and oviposit in incisions between the lower epidermis and mesophyll of the leaf. Unfertilised females produce male offspring. Eggs under observation in May and early June hatched in 12–14 days. In the first instar the larvae fed on the lower surface of the leaf without breaking through the upper surface, but in later ones they consumed large irregular areas of the leaves. They are difficult to find owing to their habit of falling from the leaves when disturbed. Females pass through 7 larval instars and males through 6 ; in the last one no feeding takes place. The feeding period of 10 larvae produced parthenogenetically lasted 21–24 days, and the average growth ratio, calculated from the width of the frons in successive instars, was 1·26. The larvae pupate in pithy stems of herbaceous plants, pruning scars on roses, the bases of old raspberry canes, etc. In summer, the period spent in the cocoon is usually 2–3 weeks, but up to 6 weeks in individual cases. Two broods occur during the year ; the adults are abundant in May and July, and some are present in June and August. Larvae may be observed on rose and strawberry from early June until September.

The larvae of *Blennocampa waldheimi* are usually found in Britain on *Spiraea* growing in damp situations, but considerable numbers have been taken on strawberry in Somerset. Females under observation oviposited freely on strawberry, and it is possible that the insect may become a pest where the wild food-plant is destroyed by drainage and reclamation. The adults may be found near strawberry plants in the second half of May and the first half of June, and oviposit in incisions, usually near the edges of the leaves. In the laboratory the eggs hatched in 13–16 days. The larval feeding period of six larvae bred parthenogenetically on strawberry occupied 32–38 days, and the average growth ratio in the five successive instars was 1·26. The larvae construct cocoons at a depth of 2–3 ins. in the soil, and remain in them from July until the following spring, when they pupate, there being only one generation in the year. Thelytokous parthenogenesis occurs in this species.

Descriptions are given of the adults and larvae of both the sawflies, including each of the five instars of *B. waldheimi*.

Ferrière (C.). **The Parasites of the Coffee Leaf-miners** (*Leucoptera* **spp.) in Africa.**—*Bull. ent. Res.* **27** pt. 3 pp. 477–491, 5 figs., 18 refs. London, September 1936.

The literature on the 17 species of parasitic Hymenoptera known to attack coffee leaf-miners of the genus *Leucoptera* in America and Africa is reviewed. Two species of *Leucoptera* are now known to be present on coffee in Africa [*R.A.E.*, A **23** 664], *L. coffeella*, Guér., and *L. daricella*, Meyr., but up to 1934 only the former was recognised, so that it is uncertain to which species previous records of parasitism may be attributed. As a result of a study of collections from Tanganyika, Kenya, Nyasaland and Uganda, 14 species of Chalcidoids are recorded, of which 10 are new. All are represented in the material from Tanganyika, and both the records from *L. daricella* refer to that Territory. The previously described species are *Elasmus leucopterae*, Ferrière, from *L. daricella* on *Pavetta ternifolia* and (also in Kenya) from *Leucoptera* sp. on coffee and other plants ; and *Atoposoma variegatum*, Masi, var. *afra*, Silv. (also in Nyasaland and Kenya), *Eulophus borboricus*, Giard., and *Closterocerus africanus*, Wtstn., all from *Leucoptera* of uncertain

identity on coffee. The new species (described from both sexes except where otherwise indicated) are *Cirrospilus cinctiventris* from *Leucoptera daricella* on *Pavetta ternifolia* and a Lepidopterous leaf-miner on *Bridelia micrantha*; and *Tetrastichodes leucopterae* (female only), *Pleurotropis coffeicola* (also in Uganda and Kenya), *Trigonogastra nigricola*, *Cirrospilus longifasciatus* (female only), *Sympiesis bukobensis*, *Derostenus coffeae*, *Chrysocharis lepelleyi* (also in Kenya) and *Teleopterus violaceus* and *Achrysocharella ritchiei* (both also in Kenya and Nyasaland), all from *Leucoptera* on coffee. *P. coffeicola* and *Tetrastichodes leucopterae* were also obtained from *Leucoptera* on plants other than coffee in Tanganyika. The genera *Trigonogastra*, *Cirrospilus*, and *Chrysocharis* have not previously been recorded from Africa. From the numbers of specimens received for identification, the order of importance of these parasites of *Leucoptera* appears to be *P. coffeicola*, *A. ritchiei*, *Elasmus leucopterae*, the Braconid, *Apanteles bordagei*, Giard, and *Atoposoma variegatum* var. *afra*. This is confirmed by a previous report [*loc. cit*]. The *Chrysocharis* mentioned in this report was later identified with the genus *Achrysocharella*.

A key is given to all the known African parasites of *Leucoptera*. Of these the only species not mentioned above is the Braconid, *Mirax leucopterae*, Wlkn., which occurs in Tanganyika [**25** 74].

COMPERE (H.). **A new Species of *Habrolepis* parasitic on *Chrysomphalus aurantii*, Mask.**—*Bull. ent. Res.* **27** pt. 3 pp. 493–496, 1 fig. London, September 1936.

A description is given of the female of *Habrolepis rouxi*, sp. n., an internal parasite reared from a red scale apparently identical with *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., in the Transvaal. *H. rouxi* is thought to be a native of Africa that has only recently attacked this scale, having originally parasitised some indigenous Coccid.

A. aurantii was first described from Australia, and was reported at about the same time from California (where it had been introduced from Australia) and Europe, and later from Africa, where it was already well established. The red scale known as *A. aurantii* in India, Japan and China (which some entomologists consider to be the place of its origin) is not identical with the Californian *aurantii*. The species are taxonomically indistinguishable, and in the field there is no apparent difference in their habits, but the oriental form is subject to parasitism by *Comperiella bifasciata*, How., *Casca chinensis*, How., *Prospaltella aurantii*, How., and *Aspidiotiphagus citrinus*, Cwfd., while, although the parasites oviposit freely in the Californian form, the eggs or larvae do not mature. The oriental *aurantii*, in which these parasites mature, is found in China and India on *Citrus*, *Cycas* and *Euonymus*, in Japan on *Citrus*, probably in Japan and Argentina on *Podocarpus* spp., and possibly in Argentina on *Citrus*. The Californian *aurantii* is found in California on *Citrus*, in India, Brazil and Paraguay on rose (but not on *Citrus* even when the plants are in contact with infested roses), and probably in Europe, Africa, central Chile and Australia. *Aspidiotiphagus lounsburyi*, Berl. & Paoli, which sometimes parasitises the Californian *aurantii* on rose in Brazil and Africa, but is often more abundant in other hosts in the same district, is the only previously described species now recognised as an internal parasite of this form. There is some evidence that the oriental *aurantii* may prove to be identical with the yellow scale, *Aonidiella* (*Chrysomphalus*) *citrina*,

Coq. [*cf. R.A.E.*, A **22** 134]. The Aphelinid ectoparasite, *Aphytis chrysomphali*, Merc., which occurs in all continents, is frequently reared from *Aonidiella aurantii* and other Diaspine Coccids. *H. rouxi* parasitises scales that are taxonomically indistinguishable from the Californian red scale, *A. aurantii*, the Californian yellow scale, *A. citrina*, and the so-called Asiatic red scale.

MARSHALL (Sir G. A. K.). **New injurious Curculionidae (Col.) from South America.**—*Bull. ent. Res.* **27** pt. 3 pp. 497–501, 3 figs. London, September 1936.

The new weevils described are *Premnotrypes fractirostris*, bred in England from potatoes received from Peru, and *Hypsonotus parceguttatus*, *H. modestus* and *Acallestes camelus*, all taken as adults feeding on cacao in Brazil.

DODD (A. P.). **The Control and Eradication of Prickly-Pear in Australia.**—*Bull. ent. Res.* **27** pt. 3 pp. 503–517, 3 pls. London, September 1936.

Much of the information given in this account of the biological control in Australia of prickly-pear, particularly the two most important species, *Opuntia inermis* and *O. stricta*, has already been noticed [*R.A.E.*, A **18** 287; **20** 363; **21** 276; **23** 398, etc.]. About 25 million acres of the 60 million that were infested in 1925 have now been recovered. Between 50 and 60 species of cactus insects have been introduced, after field and laboratory investigations and extensive feeding tests to determine the possibility of economic plants being attacked by them. The species now established throughout the prickly-pear areas include *Cactoblastis cactorum*, Berg, from Argentina, *Chelinidea tabulata*, Burm., and *Dactylopius opuntiae*, Ckll., from the United States, *D. ceylonicus*, Green (which is restricted to *O. monocantha*) from India and Argentina, *Dactylopius* sp. near *confusus*, Ckll. (restricted to *O. aurantiaca*) from Argentina, and *Tetranychus opuntiae*, Banks. Of the species that come into competition for food-supply with *C. cactorum*, the numbers of all except *D. opuntiae* have been so reduced that their value has become negligible. *C. cactorum* has given much better results on the normal green pear than on yellow pear, which is a slow-growing chlorotic form of *O. inermis*, that yields few fruits and little succulent growth and that occurs on poor soil. The larval survival of *C. cactorum* in this form was 8 per cent. compared with 33 per cent. in green pear, and the average increase per generation was about 79 per cent. as compared with 1,209 per cent. This is probably due to the low nitrogen content of yellow pear, which is less than 50 per cent. of that of green pear. In one series of experiments typical yellow pear was treated with enough nitrogen fertiliser to turn the plants green without stimulating new growth. The survival rate of the larvae was 9·5 per cent. in the yellow pear, and 26·1 per cent. in the treated pear, and the generation increases were 221 and 1,108 per cent. respectively. The use of artificial stimulants is impracticable for large areas, but if trees (which take most of the available supply of nitrogen in the soil) are removed, the yellow pear becomes the normal free-growing plant subject to greater destruction by *C. cactorum*. In several districts this method has been successful.

As regards the less important species of *Opuntia*, destruction of tiger-pear, *O. aurantiaca*, by *C. cactorum* is transient, but *Dactylopius*

sp. near *confusus*, which was introduced in 1932, is now damaging it in several localities, and the Pyralid moth-borer, *Tucumania tapiacola*, Dyar [*cf.* **24** 379] is also being reared and liberated. The Lamiids, *Moneilema ulkei*, Horn, and *Lagochirus funestus*, Thoms., have been introduced against *O. tomentosa*.

HARRIS (W. V.). **Annotated List of Insects injurious to Cotton in Tanganyika.**—*Bull. ent. Res.* **27** pt. 3 pp. 523–528. London, September 1936.

This is an annotated list of 112 insects that feed on cotton in Tanganyika, grouped according to the part of the plant they usually attack. Of these two are injurious to seedlings; 10 to stems and branches, particularly *Microtermes* sp., *Apion xanthostylum*, Wagn., and *Tragiscoschema nigroscriptum*, Fairm.; 46 to the leaves, particularly *Empoasca facialis*, Jac., *Helopeltis bergrothi*, Reut., *Lygus* spp., *Aphis gossypii*, Glov., *Zonocerus elegans*, Thnb., *Prodenia litura*, F., *Hodotermes mossambicus*, Hagen, *Sylepta derogata*, F., and *Hippotion celerio*, L.; 11 to the flowers; 39 to the green bolls, particularly *Calidea bohemani*, Stål, *Dysdercus cardinalis*, Gerst., *D. fasciatus*, Sign., *D. nigrofasciatus*, Stål, *D. superstitiosus*, F., *Nezara viridula*, L., *Platyedra gossypiella*, Saund., *Earias insulana*, Boisd., *E. biplaga*, Wlk. (*citrina*, Saalm.), and *Heliothis armigera*, Hb. (*obsoleta*, F.); and 4 are found in open bolls.

Insect Pests and Their Control.—*Agric. Gaz. N.S.W.* **47** pt. 9 pp. 521–525, 7 figs. Sydney, September 1936.

The insect pests in New South Wales dealt with in this part of a series [*cf. R.A.E.*, A **25** 12] include *Caliroa limacina*, Retz., which feeds on pears and cherries, and occasionally on plums, quinces and hawthorn [*Crataegus*]. It has two generations a year, the adults emerging in October and December–January. The eggs are laid in the leaves and hatch in about 2 weeks in spring. The larvae skeletonise the leaves, feeding chiefly on the upper surface, and those of the second generation, which are the more abundant, sometimes defoliate the trees. They pupate in the soil, the winter being passed in the prepupal stage. Sprays containing lead arsenate are recommended for control.

NOBLE (N. S.). *Pristhesancus papuensis* **Stål, an " Assassin " Bug.**—*J. Aust. Inst. agric. Sci.* **2** no. 3 pp. 124–126, 1 fig. 2 refs. Sydney, September 1936.

Pristhesancus papuensis, Stål, a predacious Reduviid that occurs in the tropical region lying between Papua and northern New South Wales and has been recorded as attacking injurious Rhynchota in Queensland [*R.A.E.*, A **10** 1; **20** 164], was found to pair and develop readily in breeding cages. The eggs were laid in clusters of 30–40, together with a fluid that cemented them to the sides of the cage. The egg stage lasted 15 days in spring and 45 in autumn. The nymphs at first remained near the egg-mass, sometimes feeding on the contents of unhatched eggs. The first instar lasted 7 days, during which the nymphs were fed on Aphids. For the next fortnight they were fed successively on adults of *Drosophila* sp. and *Lonchaea aurea*, Macq., and then on *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) for 3 weeks. They were then able to catch blowflies and were fed on

them until they reached maturity. The nymphal period occupied 70–85 days in summer. All the adults, which were fed solely on blowflies, lived for 3 months, some for 8 and one for 11. The method of catching and holding the prey is described. Bugs often fed on a number of flies in succession and then passed several days without food, taking no interest in flies near them.

MUGGERIDGE (J.). **Entomology Section.**—*Rep. Dep. Agric. N.Z. 1935–36* pp. 49–50. Wellington [N.Z.] 1936.

During 1936, army-worms infested over 15,000 acres of lowlying country subject to flooding in North Auckland province of New Zealand, stripping pastures that were kept for hay, etc. The white butterfly [*Pieris rapae*, L.] which was reduced to insignificant numbers by the introduced pupal parasite [*Pteromalus puparum*, L.] during 1935 [*cf. R.A.E.*, A **24** 3] again increased in the Hawke's Bay area and other districts in North Island, although not to its original abundance. This may have been due to wet conditions, as the rates of parasitism of pupae differed according to whether they were collected from grass or from posts. During the 1935–36 season, 79,000 parasites were distributed. Further experiments on the value of winter sprays of oil against the eggs of *Paratetranychus pilosus*, C. & F. [*cf.* **23** 437] showed that neither the viscosity of the oil nor the stability of the emulsion affected the mortality significantly. Oils had no effect at all when applied in July and early August to eggs on batches of twigs, which were then exposed in cages out of doors, and those applied in late August and September killed only 40 per cent. The natural mortality was high, being about 40 per cent. in 75 per cent. of the trials. Weather conditions were generally unfavourable to control by these sprays. In field tests, oils of different viscosities and in emulsions of different stabilities were applied to 204 apple trees, to one block in early July, and to a second in early September. In July and September, overwintering eggs of *P. pilosus* were plentiful on most of the trees, but in mid-December mites were scarce on all trees, including the control ones, so that no results were obtained. Counts taken 10 days after spraying showed that summer oil (1 : 33) gave 50–90 per cent. control of adults of *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., on lemons. Adult scales were more resistant than other stages. Two consecutive applications gave good control.

JOUBERT (C. J.). **The Blue-Green Citrus Nibbler.**—*Fmg in S. Afr.* 1936 reprint no. 36, 2 pp., 2 figs., 1 ref. (Also as *Fmrs' Bull. Stellenbosch-Elsenburg Coll. Agric.* no. 104.) Pretoria, May 1936. [Recd. November 1936.]

A short account is given of the results of observations in 1927–29 on the Eumolpid, *Colasposoma fulgidum*, Lef., the adults of which occasionally cause severe damage to *Citrus* in the Transvaal, attacking the leaves from the edges so that they have a frayed appearance, and also eating the outer layer of the rind of young fruits.

The eggs are laid in clusters in sheltered places on the trees and hatch in 2–4 weeks. The larvae at once drop to the ground and enter the soil, where they occur at a depth of about 3 inches and eventually pupate in earthen cells. The larval food was not ascertained. The larval and pupal periods probably last about 9 months and 1 month, respectively. The adults emerge in the latter half of October, and most of the eggs

are deposited during November and December. Of 6 females observed, 3 laid over 400 eggs each. The life of the adults varied from 2 to 4 months. Towards the end of December the beetles begin to decrease in numbers and at the end of January few can be found. Cultivated plants on which the beetles feed are *Citrus* and occasionally guava, eggs being found on both ; native plants are *Combretum erythrophyllum*, *Zizyphus mucronata*, *Gymnosporia buxifolia* and, to a less degree, *Royena pallens*.

During an outbreak in 1927, numbers of the beetles were caught and destroyed by shaking them off the trees on to a canvas sheet and then tipping them into a tin containing water with a film of oil on the surface ; this is best done in the cooler part of the day when the beetles are less active. Coating the sheet with an adhesive might be an improvement [*cf. R.A.E.*, A **13** 1]. Orchards in infested areas should be regularly cultivated in order to kill the larvae, and native food-plants in the vicinity should be destroyed.

KADEN (O. F.). **Die Nashornkäferplage der Kokospalmen im Golf von Guinea.** [The Rhinoceros Beetle Pest of Coconut Palms in the Gulf of Guinea.]—*Tropenpflanzer* **39** no. 10 pp. 409–414, 2 figs., 3 refs. Berlin, October 1936.

Three species of rhinoceros beetles, known throughout tropical Africa, *Oryctes monoceros*, Ol., *O. boas*, F., and *O. gigas*, Lap., attack coconut palms on the mainland of the Gulf of Guinea, while a fourth, *O. latecavatus*, Fairm., is known only from the islands of São Thomé and Principe. A brief general outline is given of the morphology and ecology of these species. Measures for their control in the coconut plantations, which are usually small and scattered, failed to afford lasting protection, as the beetles, which have great powers of flight, re-appeared after eradication, though these infestations were always confined to certain plantations and even to certain coconut palms growing beside others that remained free from attack. In investigating the reasons for this, the first point ascertained was that the beetles are not restricted to palms and are common in the forests ; in São Thomé they were commonest in the hills where no palms occur. It was further observed that infestation was less severe in palms on permeable soil or near running water, and also in those that have spherical nuts, fruits close together and upright, vigorous fronds. It is considered that the protection of birds would be a decisive measure against rhinoceros beetles. In Principe the beetles are rare and birds are abundant, owing to the many nesting places available, whereas in São Thomé, which is overrun by the beetles, most of the forest and bush has been destroyed and birds are scarce. It is suggested that the growth of bush should be promoted there and that re-afforestation should be proceeded with.

MORSTATT (H.). **Kaffee-Schädlinge und -Krankheiten Afrikas. IV. Beschädigungen der Blüten und Kirschen.** [Coffee Pests and Diseases in Africa. IV. Injuries to the Blossoms and Berries.] —*Tropenpflanzer* **39** no. 11 pp. 455–481, 17 figs. Berlin, November 1936.

The pests dealt with in this fourth article of a series [*R.A.E.*, A **24** 622, etc.] include Collembola, Heteroptera, Coccids, a Pyralid (*Thliptoceras octoguttale*, Feld.), Diptera and Coleoptera.

Mancion (J.) & Alibert (H.). **La production du café au Togo (cercles de Klouto et d'Atakpamé) et quelques insectes déprédateurs du caféier.**—*Agron. colon.* no. 224 pp. 33–43, 3 figs., 2 pls., 1 ref. Paris, August 1936.

An account is given of the cultivation of coffee in the districts of Klouto and Atakpamé in French Togoland, with brief notes on the insect pests attacking it. The most serious are *Bixadus* (*Monohammus*) *sierricola*, White [*cf. R.A.E.*, A **24** 75] and *Stephanoderes hampei*, Ferr. The latter develops from egg to adult in about a month, and the adults live for 2 or 3 months. It is most abundant in low-lying country and in the rainy season (October and November). Other pests are *Zonocerus variegatus*, L. [*cf.* **23** 356], which causes considerable damage, but has been effectively controlled in experiments by spraying the leaves of the coffee with an arsenical, the leaf-miner, *Gracilaria coffeifoliella*, Motsch., *Apate monacha*, F. [*cf.* **21** 547], *Pseudococcus citri*, Risso, which occurs on the roots, and termites, which readily attack bushes already infested by borers. *Araeccerus fasciculatus*, DeG., sometimes infests the recently harvested coffee berries while they are being dried.

Demonstrações de processos de combate á saúva. Relatorio da Commissão technica de julgamento. [Demonstrations of Methods for the Control of Leaf-cutting Ants. Report of the Technical Commission.]—36 pp., 14 fldg tables. Rio de Janeiro, Minist. Agric., Serv. Def. sanit veg., 1936.

Work against leaf-cutting ants [chiefly *Atta sexdens*, L.] in Brazil is hampered by lack of co-ordination. As a first step in an organised campaign, a government commission has examined the various existing methods. The present report is on various toxic agents and apparatus for applying them submitted and demonstrated. Tables show the names of the firms and of the materials and apparatus, the number of tests in which the latter were or were not efficient, and other relevant particulars, such as costs, etc. Notes supplementing the tabulated information conclude by stating that neither the generators nor the blowers of poisonous gases attain a desirable efficiency, and that carbon bisulphide proved the best fumigant, a mixture of white arsenic and sulphur coming next.

Monte (O.). **A vaquinha da pimenteira** *Epicauta montei*, **Denier.** [The Pimento Beetle, *E. montei*.]—*Campo* **7** no. 81 p. 33, 1 fig. Rio de Janeiro, September 1936.

In Minas Geraes (Brazil), *Capsicum frutescens* and *C. annuum* are sometimes severely injured by the adults of *Epicauta montei*, Denier. A lead arsenate spray should be applied as soon as attack is observed.

Ronna (E.). **Vegetais que são nossos auxiliares na luta contra as pragas da lavoura.** [Fungi and Bacteria that assist us in combating Pests of Agriculture.]—*Campo* **7** no. 81 pp. 56–58, 4 figs. Rio de Janeiro, September 1936.

This is a brief survey from the literature of the fungi and bacteria that may be of value in the control of insect pests in Brazil.

Martyn (E. B.) & Follett-Smith (R. R.). **The Fish Poison Plants of British Guiana, with special Reference to the Genera** *Tephrosia* **and** *Lonchocarpus.*—*Agric. J. Brit. Guiana* **7** no. 3 pp. 154–159, 8 refs. Georgetown, September 1936.

An account is given of the appearance and growth of plants that are used as fish poisons in British Guiana and are of possible value as a source of insecticides, with special reference to *Tephrosia toxicaria* and species of *Lonchocarpus*, including *L. densiflorus*, *L. rariflorus* and *L. nicou* (white haiari). L. A. Robinson estimated [*cf.* next paper] that two samples of roots of *L. nicou* contained on the air dry basis 2·25 and 1·38 per cent. of the rotenone-carbon tetrachloride complex and on the oven dry basis 2·45 and 1·50 per cent.

Robinson (L. A.). **Note on the Estimation of Rotenone in British Guiana Haiaris.**—*Agric. J. Brit. Guiana* **7** no. 3 pp. 191–192, 3 refs. Georgetown, September 1936.

A modified method is outlined for the determination of rotenone in roots of haiaris [*Lonchocarpus*] grown in British Guiana, as estimation by the other methods [*R.A.E.*, A **21** 271 ; **24** 62] did not give concordant results from duplicate samples, or even from equal quantities of the extract from the same sample.

Walters (E. A.). **Entomological Investigations.**—*Rep. Dep. Agric. St Lucia 1935* pp. 29–30. Castries, 1936.

During 1935, preliminary observations were made on weevils of the genus *Diaprepes*, the larvae of which caused damage to the roots of *Citrus* throughout St. Lucia, but principally in the coastal valleys subject to drought in the dry season. The damage is followed by yellowing of the trees in the dry season and often by severe attacks of purple scale [*Lepidosaphes beckii*, Newm.] and snow scale [*Prontaspis citri*, Comst.], from which orange and grapefruit usually recover but which cause lime to die back seriously. The adult weevils were observed in May after the first soaking rains, and oviposition took place from June to September, reaching peaks in the first half of June and the latter half of July. The leaves of lime seem to be preferred to those of orange or grapefruit for oviposition. Eggs were observed to be parasitised by the Eulophid, *Tetrastichus haitiensis*, Gah., and to a less extent by *Ufens osborni*, Dozier [*cf. R.A.E.*, A **22** 539]. The degree of parasitism varied from week to week in the same district and from 2 to 85 per cent. in different districts.

Musser (D. R.). **Observations on the Effectiveness of some Moth-proofing chemical Compounds.**—*J. Kans. ent. Soc.* **9** no. 4 pp. 116–125, 7 refs. McPherson, Kans., October 1936.

The tests described were made against the larvae of the case-making and webbing clothes moths [*Tinea pellionella*, L. and *Tineola biselliella*, Humm.] and the black, common and varied carpet beetles [*Attagenus piceus*, Ol., *Anthrenus scrophulariae*, L., and *A. verbasci*, L.]. Pieces of woollen blanket were treated with saturated solutions of sodium fluoride, sodium fluosilicate, or one of a number of proprietary compounds, and 5 larvae were used in each test. All of the compounds offered approximately complete protection, the larvae being either

killed directly or else dying from starvation. Dry-cleaning or washing removed a sufficient amount of the sodium fluosilicate and one of the proprietary compounds from the fabrics to permit the larvae to cause appreciable damage. Similar tests were not carried out with the other compounds used. Complete immersion of the fabrics gave slightly better protection than the application of the solution as a spray. The larvae of the moths were killed more quickly by the compounds tested than were those of the beetles.

Reppert (R. R.) & Bentley (M. R.). **The practical Use of the Sun in Cowpea Weevil Control.**—*J. Kans. ent. Soc.* **9** no. 4 pp. 126–139. McPherson, Kans., October 1936.

Experiments were carried out in Texas to ascertain the degree of control that could be obtained by exposing cowpeas infested with the Bruchid [*Bruchus chinensis*, L.] to the rays of the sun. Exposure was made in wooden trays filled to a depth of half an inch with the cowpeas. The results are given in detail in a series of tables, and the following conclusions are drawn : Exposure of cowpeas to the open sunlight on a clear day, with no wind blowing, between the hours of 10 a.m. and 4 p.m. when shade temperatures are 98°F. or more, for a period of 75 minutes or more will result in the complete destruction of all Bruchids that may be infesting them. Under the same conditions of temperature, but with the trays covered with glass, an exposure of 15 minutes will bring about the same result. Germination is not seriously affected by exposure without glass for as long as 5 hours, provided that the shade temperature does not rise above 100°F., or by exposure with glass for 1 hour when the shade temperature is not more than 96°F. Under these last conditions, exposure for as long as 5 hours reduces the percentage of germination considerably, but does not apparently reduce the vigour of the resulting plants. Although the initial number of plants, because of reduced germination percentage, may be smaller over a given planted area, a greater percentage of these persist in growth and the final total weighted production and average weight per plant are greater than in the case of cowpeas receiving the milder treatments.

Gnadinger (C. B.), Evans (L. E.) & Corl (C. S.). **Pyrethrum Plant Investigations in Colorado. A Review of the Progress since 1932.** —*Bull. Colo. Exp. Sta.* no. 428, 29 pp., 4 figs., 9 refs. Fort Collins, Colo., July 1936. [Recd. November 1936.]

An account is given of further investigations in Colorado [*cf. R.A.E.*, A **22** 30] on the factors that affect the pyrethrin content of flowers of *Chrysanthemum cinerariaefolium* in experimental and commercial crops. The following is substantially the authors' summary : There is considerable variation in the number and weight of flowers, and there is also a wide variation in the pyrethrin content of flowers produced by individual plants during the same year and from year to year. Progeny lines from parent plants with a high pyrethrin content yielded slightly higher pyrethrin contents than those grown from common seed stock. A close relationship was found between pyrethrin content and temperature during the growing season, as the pyrethrin content was high in the cool mountain valleys and low where mean monthly temperatures were high. The application of commercial fertilisers had little effect on the yield of flowers or pyrethrins under the conditions of the

experiment. The yields of flowers and pyrethrins of 25 foreign and domestic strains of pyrethrum were compared, and the results did not show any outstanding strains or plants. Immature or nearly mature flowers retained their pyrethrin content during storage. There was only a little more decomposition of pyrethrins in uncompressed flowers than in flowers compressed under 16,000 lb. pressure. The increased yield of flowers and pyrethrins in the mountain districts has led to the abandonment of plantings at lower altitudes.

SHERWOOD (E. C.). **Orchard Spraying Guide for West Virginia.**—*Ext. Circ. W. Va Coll. Agric.* no. 304 (revd) 39 pp., 3 figs. Morgantown, W. Va, January 1936. [Recd. November 1936.]

This circular includes spray programmes against insects and fungi attacking apples, pears, plums, peaches and cherries in West Virginia, and details of the preparation and application of the sprays recommended, together with notes on supplementary measures against the codling moth [*Cydia pomonella*, L.], and an account of methods of washing for removing residues of lead and arsenic from apples.

SHERWOOD (E. C.). **Farm Crop Pest Control Guide for West Virginia.**—*Ext. Circ. W. Va Coll. Agric.* no. 305 (revd) 44 pp., 8 figs. Morgantown, W. Va, March 1936. [Recd. November 1936.].

The greater part of this circular consists of programmes for the control of pests and diseases of different vegetables, cereals, small fruits, orchard trees and ornamental plants in West Virginia and notes on the preparation of sprays and dusts and apparatus for applying them. The remainder deals with general control measures, certain special measures, such as the use of mercury bichloride against the cabbage maggot [*Phorbia brassicae*, Bch.], and the control of polyphagous pests.

BAKER (W. W.). **Notes on a European Weevil,** *Ceutorhynchus assimilis* **Payk., recently found in the State of Washington.**—*Canad. Ent.* **68** no. 9 pp. 191–193, 9 refs. Orillia, Ont., September 1936.

In 1935, adults of *Ceuthorrhynchus assimilis*, Payk., were taken from mustard in several places in north-western Washington, one of which is close to the area where much of the cabbage seed used in the United States is produced, and dried seed-vessels of mustard collected in the following winter showed evidence of infestation by the larvae. This weevil had not previously been observed in North America. Notes are given on its bionomics and control, compiled from abstracts published in this *Review*. The fact that pupae have been found in turnip seed in Britain (though pupation usually occurs in the soil) suggests that infestation may be disseminated by seed shipments.

FLEMING (W. E.) & BAKER (F. E.). **A Method for estimating Populations of Larvae of the Japanese Beetle in the Field.**—*J. agric. Res.* **53** no. 5 pp. 319–331, 7 figs. Washington, D.C., 1936.

The following is the authors' summary: A method has been developed for estimating the population of larvae of the Japanese beetle [*Popillia japonica*, Newm.] in the field. The number of larvae in each square foot of four 2,500-square-foot plots was determined,

and the results were used in estimating the true averages in each plot by different methods. The 1-square-foot unit was found to be the most accurate for estimating the population. As the size of the sampling unit was increased, the error became progressively larger. The size and not the shape of the sampling unit was the modifying factor. The error of the estimate is influenced to some extent by the density of the population. It is possible to estimate a dense population more accurately than a sparse population. It is recommended that in estimating the larval population a minimum of 25 units of 1 square foot uniformly distributed constitute a sample from plots containing less than 2,500 square feet, and in larger areas that the units be spaced not more than 10 feet apart. The larval populations can be estimated most accurately with a minimum of labour in large areas covering several acres by estimating the number of larvae in 2,500-square-foot plots placed in representative portions. By proper sampling it was found to be possible to obtain a reliable estimate of the larval population in a given area.

Haseman (L.). **The Hessian Fly and its Control.**—*Circ. Mo. agric. Exp. Sta.* no. 192, 4 pp., 1 map. Columbia, Mo., September 1936.

In the autumn of 1935, the Hessian fly [*Mayetiola destructor*, Say] was abundant on wheat in Missouri, many of the early sown fields being almost bare before winter. The spring brood, however, was practically destroyed by cold rains and late frosts, and the yield of wheat was exceptionally good. In spite of this, some infestation is expected in future years, and methods of control are discussed [*R.A.E.*, A **24** 254].

Marsh (F. L.). **Egg Placing by** *Dibrachys boucheanus* **Ratzeburg.**—*Canad. Ent.* **68** no. 10 pp. 215–216, 1 ref. Orillia, October 1936.

A description is given of the method of egg-laying of the Pteromalid, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.), which commonly occurs as a hyperparasite attacking the Ichneumonid, *Spilocryptus extrematis*, Cress., parasitising *Samia cecropia*, L., in Illinois. Usually 1 or 2 clusters of about 6–8 eggs are laid on the cuticle of the host larva or pupa. After each cluster has been completed, the female punctures the host and injects a poison that ensures its slow death and partial preservation.

This Pteromalid is not specific in its choice of a host, and hence has a cosmopolitan distribution. Females kept in subdued light at 75°F. and fed on dilute honey oviposited for as long as 50 days, individuals laying as many as 400 eggs. When they were exposed to higher temperatures and sunshine, 19 generations were completed in 12 months. The only natural food that adults took was the sap of box-elder.

Knowlton (G. F.) & Smith (C. F.). *Capitophorus* **Aphids infesting** *Artemisia*.—*Canad. Ent.* **68** no. 10 pp. 229–234, 1 pl. Orillia, October 1936.

About 75 species of *Artemisia*, some of which are of value as food for livestock, occur in the Rocky Mountain region of the United States, and many of them are often considerably infested with Aphids. In this paper is given a key to 8 of these, all belonging to the genus *Capitophorus*, 6 of which are described as new, with records of their distribution.

Shaw (F. R.). **Care of Thrips-infested Corms.**—*Gladiolus Bull.* **3** no. 11 pp. 1–2, 3 refs. Ithaca, N.Y., November 1936.

In the areas of the United States in which *Taeniothrips simplex*, Morison, passes the winter in stored corms of *Gladiolus*, infestation is reduced by quick harvesting of the corms. If the corms are severely infested, the author recommends fumigation with naphthalene at the rate of $\frac{1}{2}$ oz. per 100 corms, or $\frac{3}{4}$ oz. if the corms are large, or with calcium cyanide at the rate of 1–4 oz. per 100 cu. ft. space. The naphthalene may be scattered among the corms in paper bags or cardboard boxes and left during the storage period, but the calcium cyanide must be used in an air-tight container and should be applied 3 times at intervals of 10 days, as it does not kill the eggs. In experiments on the use of low temperature [*cf. R.A.E.*, A **24** 534], the thrips were killed by exposure to 28°F. for 8 days, but the corms were injured. The author considers that a period of two months at 35°F. would give good control.

Felt (E. P.). **Two new Cockle Burr Midges (Diptera : Cecidomyiidae).**—*Ent. News* **47** no. 9 pp. 231–233. Philadelphia, Pa, November 1936.

Descriptions are given of both sexes of two Cecidomyiids reared by L. F. Hitchcock of the Australian Commonwealth Prickly Pear Board Xanthium Investigations, namely, *Asphondylia xanthii* from galls on the growing tips of the branches of *Xanthium speciosum* in Texas, and *Mycodiplosis radicis* from the roots of *Xanthium* sp. in Alabama.

Watson (J. R.) & others. **Entomology.**—*Rep. Florida agric. Exp. Sta. 1934–35* pp. 64–69 & 100. Gainesville, Fla. [1936.]

An important feature of the year 1934–35 was the discovery of *Anthonomus eugenii*, Cano, in Manatee County; it seems likely to become a serious pest of peppers [*Capsicum*] in Florida. The Florida flower thrips, *Frankliniella cephalica bispinosa*, Morg., was very abundant in late April and May 1935 following a period of sub-normal rainfall, and was observed to migrate from garden peas to the leaves and later the flowers of beans, causing an abnormal drop. *F. cubensis*, Hood, was observed for the first time in Florida, and *Gynaikothrips uzeli*, Zimm., spread over a wider area in the north of the State. The Coccinellid. *Leis dimidiata*, F., ab. *quinquedecimspilota* Hope, has maintained itself in the small area into which it was originally introduced against Aphids on *Citrus*, but attempts to introduce it elsewhere have not succeeded, the factor limiting its establishment apparently being the summer food-supply [*cf. R.A.E.*, A **22** 693]. Only half the usual number of *Leptoglossus phyllopus*, L., which infested *Citrus* in 1934, survived the exceptionally cold winter, and from 25 to 50 per cent. of the examples found on thistle in the spring bore eggs of parasites. *Acanthocephala femorata*, F., *A. confraterna*, Uhl., and *Nezara viridula*, L., were less affected by the cold, but were all more heavily parasitised than usual. Observations on the shedding of pecan nuts showed that out of a potential loss of 25–40 lb. per tree, only 10 per cent. was caused by *Acrobasis caryae*, Grote [*cf.* **21** 292].

Thrips tabaci, Lind., severely damaged the buds and young leaves of celery, feeding at or below the ground-level on newly transplanted celery, and later above ground-level. On young plants, the best

control was given by a spray containing nicotine sulphate or pyrethrum, applied at high pressure. On celery prepared for blanching, nicotine and rotenone dusts gave better control than sprays, which do not penetrate the outer leaves sufficiently, and application of a pyrethrum dust from an aeroplane was not so successful as good ground work. Naphthalene mixed with an equal weight of lime gave good control and caused no serious scorching of foliage. It has a toxic effect on the thrips and probably also acts as a repellent. Onions planted some distance from grass and weeds largely escaped infestation by *T. tabaci*.

Taeniothrips simplex, Morison (*gladioli*, Mlt. & Stnw.) now occurs on *Gladiolus* practically throughout the State. Stored corms inspected in August were found to be lightly infested, but the main summer survival is on plants that spring up after the corms have been dug. Eleven complete generations were observed from 1st July 1934 to 1st July 1935. Development was most rapid from April to June and during October and November, and was retarded in the summer and winter, when a generation required twice as long as in the spring or autumn [*cf.* **22** 693]. A commercial rotenone dust gave the best control, while a dust containing pyrethrum or one of 4 per cent. nicotine sulphate and lime was satisfactory. Early application is advised.

On grapefruit trees sprayed with Bordeaux mixture, infestation by the purple scale [*Lepidosaphes beckii*, Newm.] was less severe when the concentration used was 3 : 3 : 100 than when it was 6 : 6 : 100, except on trees that also received an application of oil emulsion. Good control was obtained on these trees, but they suffered a rather high percentage of injury by the rust mite [*Phyllocoptes oleivorus*, Ashm.], even with 5 applications of sulphur dust. Plots sprayed with Bordeaux mixture and dusted with sulphur 7 times showed the greatest increase of scale insects of any, including the controls. In general it was found that three sprays of lime-sulphur, or two of lime-sulphur with the addition of either wettable sulphur or bentonite sulphur gave results comparable with those obtained from one application of a 1 per cent. oil emulsion. The amount of sooty mould associated with Aleurodids was least on the trees sprayed with oil emulsion and greatest on those that received no sprays after the Bordeaux mixture.

KNOWLTON (G. F.). **Pipunculidae.**—*Proc. Utah Acad. Sci.* **13** pp. 245–247. Provo, Utah, 1936.

Records are given of 10 species of *Pipunculus* taken in the adult stage in Utah, in connection with studies on the internal parasitism of the beet leafhopper, *Eutettix tenellus*, Baker. A table gives a summary of parasitism of adults of *Eutettix* by *Pipunculus*, Dryinids and Stylopids in various months from 1929 to 1934. A total of 17,003 leafhoppers were examined and yielded 276 *Pipunculus*, 37 Dryinids and 3 Stylopids.

KNOWLTON (G. F.). **The Insect Fauna of Utah (from the Standpoint of an Economic Entomologist).**—*Proc. Utah Acad. Sci.* **13** pp. 249–262. Provo, Utah, 1936.

This paper includes a brief general discussion of insect pests occurring in Utah and lists of Heteroptera collected in the State, with notes on those observed to be predacious on other insects.

Knowlton (G. F.) & Smith (C. F.). **Rose Insects.**—*Proc. Utah Acad. Sci.* **13** pp. 263–267, 2 figs. Provo, Utah, 1936.

A list is given of the insects that occur on roses in Utah with brief notes on the bionomics and control of some of them. They include a new species of Aphid, *Macrosiphum zoorosarum*, the alate and apterous viviparous females of which are described.

Knowlton (G. F.) & Thatcher (T. O.). **Notes on Wood-boring Insects.**—*Proc. Utah Acad. Sci.* **13** pp. 277–281, 1 fig. Provo, Utah, 1936.

Records are given of 29 Buprestids and 63 Longicorns, mostly taken in Utah. Those stated to be injurious are: *Chrysobothris femorata*, Ol., in apple trees, *Prionus californicus*, Motsch., in the roots of cherry, *Callidium antennatum*, var. *hesperum*, Csy., in *Pinus nigra*, and *Xylotrechus annosus*, Say, and *X. insignis*, Lec. (*obliteratus*, Lec.) in poplars.

Knowlton (G. F.) & Smith (C. F.). **Strawberry Insects.**—*Proc. Utah Acad. Sci.* **13** pp. 289–292, 5 figs. Provo, Utah, 1936.

One of the most injurious pests of strawberry foliage in Utah is the leafroller, *Ancylis comptana*, Froel. (*fragariae*, Walsh & Riley). The larvae of the second generation hibernate in loosely constructed cocoons in folded leaves, and pupate in spring without feeding. In 1935, the first pupae were observed on 23rd March, and two-thirds of the larvae had pupated by 12th April. Adults averaged 1–2 per sq. ft. on 5th May and 2–3 on 9th May when the majority had emerged. Oviposition was first observed on 9th May; 72 per cent. of the eggs were laid on the upper surface of the leaves, 27 per cent. on the lower surface, and 1 per cent. on the stems. Some eggs had hatched by 4th June, when adults were still abundant and ovipositing, and by 25th June some larvae had begun to pupate and a few had left the rolled leaves and were feeding on the berries. By 9th July, 75 per cent. had pupated, and adults had begun to emerge. Moths were abundant and had begun ovipositing on 15th July, when all stages of the insect were present. Oviposition of first-generation moths reached its peak on 23rd July, and larvae began to hatch on 3rd August, when new leaves had grown. By 9th August almost all the eggs had hatched and, in some places, nearly all the leaves were infested, with 1–10 larvae in each. Severe leaf-rolling was obvious by 21st August. By 12th October many of the larvae had folded the leaves downward (opposite to the way in which they fold them during the summer feeding period) and gone into hibernation. In a few cases the larvae rolled the leaves of dewberries, and under laboratory conditions they can develop on raspberry leaves. The immature stages are described.

Other pests of strawberry in Utah are *Otiorrhynchus* (*Brachyrrhinus*) *ovatus*, L., and *O.* (*B.*) *rugosostriatus*, Goeze, the larvae of which attack the roots and the adults the berries and foliage. A general description of the larva, pupa and adult is given. In preliminary control studies, one application of any of 4 baits gave 70–80 per cent. kill of the adults. They were barium fluosilicate and ground apples (1 : 15), or mixtures of 5 lb. bran, 1 U.S. pint molasses and 2 U.S. quarts water with either 4 oz. barium fluosilicate, 4 oz. calcium arsenate, or 5 lb. dried apples

and 10 oz. barium fluosilicate. For heavy infestations, 2 or 3 applications are necessary. Records are given of several other insects taken on strawberry, which are not at present known to be injurious.

KNOWLTON (G. F.) & ALLEN (M.). **Three Hemipterous Predators of the Potato Psyllid.**—*Proc. Utah Acad. Sci.* **13** pp. 293–294, 4 refs. Provo, Utah, 1936.

Descriptions are given of the feeding habits in captivity of *Orius tristicolor*, White, and *Anthocoris melanocerus*, Reut., which were predacious on the adults and nymphs of the potato Psyllid, *Paratrioza cockerelli*, Šulc, when confined with them, and of *Camptobrochis* (*Deraeocoris*) *brevis*, Uhl., which attacked the adults. All three are common on the food-plants of *P. cockerelli* in Utah, where *O. tristicolor* has also been observed feeding on an Aphid on birch.

WEST (A. S.). **Winter Mortality of Larvae of the European Pine Shoot Moth, *Rhyacionia buoliana* Schiff., in Connecticut.**—*Ann. ent. Soc. Amer.* **29** no. 3 pp. 438–448, 3 figs., 7 refs. Columbus, Ohio, September 1936.

Observations made from 1931 to 1934 on *Rhyacionia buoliana*, Schiff., infesting red pine [*Pinus resinosa*] in Connecticut showed that the winter mortality amongst the larvae increased from 42·5 in 1932–33 to 98·6 per cent. in one locality in 1933–34, the deviation of day-degrees F. from the normal for December–March being + 518 and — 331, respectively. A sudden increase in winter mortality (at about the end of December) occurred in 1933–34 but not in the three preceding years. This is believed to have been chiefly due to a period of cold during the last week of December 1933, when minima of from — 8 to — 12°F. were registered at New Haven. The percentage mortality coincident with this period varied from 63 to 92. In February 1934, a minimum of —15°F. caused severe mortality among the surviving larvae. In January 1935, minima of between —10 and —15°F. were recorded, and in one locality there was a mortality rate of 89 per cent. A table shows the minimum temperature for each month from December to March, and also the day-degrees deviation from normal for that period, from 1910–11 to 1933–34. For each of the 10 winters previous to that of 1933–34 there was an excess of day-degrees, the winters of 1931–32 and 1932–33 being the fourth and fifth warmest for the 24-year period investigated. In 1933–34, however, there was a deficiency of over 300 day-degrees, and deficiencies of the same order also occurred in the winters of 1917–18, 1919–20 and 1922–23. Under favourable conditions the time for the moth to become a serious pest, following its introduction into a plantation, varies from 3 to 5 years. It was introduced into Connecticut in 1914, and it is thought that the recurrence of unfavourable winters was probably responsible for the fact that it did not become a pest until 1926, 12 years after its establishment.

Experiments showed that the undercooling point of the larvae, which was approximately that lethal to them, varied about a mean of —4·4°F. and that the protection afforded to the larva by the bud was negligible. In the field, a lower temperature than this would be necessary to be effective.

After the severe winter of 1933–34, recovery of heavily infested stands was remarkable [*R.A.E.*, A **23** 759 ; **24**, 429], but it is not expected to be permanent, for the species has a high rate of reproduction so that a high mortality rate does not necessarily eliminate it,

though it may maintain the population at a comparatively constant level. It is considered that although winter mortality is not the only factor limiting the reproductive potential, the slow development of the outbreak in Connecticut appeared to be definitely correlated with the frequency of severely cold winters during the past 20 years, and there is little chance that the moth will become a serious pest of red pine throughout the greater part of the natural range of this tree in North America.

DANIEL (D. M.) & COX (J. A.). **Oriental Fruit Moth Control in Quince Plantings.**—*Bull. N.Y. St. agric. Exp. Sta.* no. 669, 16 pp., 9 figs., 2 refs. Geneva, N.Y., July 1936. [Recd. November 1936.]

Cydia (*Grapholitha*) *molesta*, Busck, is a serious pest of quinces in western New York, and attempts to control it by means of the parasites, *Macrocentrus ancylivorus*, Rohw., and *Ascogaster carpocapsae*, Vier., have not been successful in quince orchards [*cf. R.A.E.*, A **22** 178]. Experiments on control by means of various sprays carried out in 1933, 1934 and 1935, are here described. In 1933, 16 different treatments gave over 89 per cent. uninjured fruit, but several were not tested further because they involved the use of calcium arsenate, which was thought liable to cause scorching, though it did not do so in the tests, anabasine sulphate, which was little better than nicotine and less readily available, or heavy applications of lime or of tobacco dust, which proved undesirable. In 1934, therefore, the sprays tested were lead arsenate, summer oil, and summer oil in combination with nicotine sulphate or lead arsenate. These gave over 80 per cent. clean fruit, whereas Black Leaf 155 [a proprietary nicotine sulphate-bentonite] was not so promising. In the final series, in 1935, 10 different sprays were tested, 7 applications being given at fortnightly intervals. They contained respectively per 100 U.S. gals. : 6 lb. Black Leaf 155 A ; 6 lb. Black Leaf 155 B ; 7 lb. nicotine-bentonite ; 7 lb. nicotine and 2 lb. lead arsenate ; 3 lb. lead arsenate alternating with 7 lb. nicotine-bentonite ; 4 lb. lead arsenate ; 1 U.S. gal. summer oil and 1 U.S. pint nicotine sulphate ; 3 lb. lead arsenate and 1 U.S. gal. summer oil ; 3 lb. lead arsenate and 1 U.S. pint fish oil ; 3 lb. lead arsenate and 1 lb. tar soap. The first 5 were used with lime-sulphur and the other 5 with Bordeaux mixture. Infestation was reduced from about 84 per cent. in the control to less than 10 except with the nicotine-bentonite treatment, and with that in which lead arsenate alternated with nicotine bentonite, infestation with these sprays being 13 and 14 per cent. respectively. When 7 applications of lead arsenate were made, the lead and arsenic residues were in excess of the tolerance ; these residues can be removed by washing, but the quinces bruise excessively even with the most careful handling.

The author concludes that the first application should be made in the calyx stage, and the last a month before harvest.

PARKER (R. L.) & LAMERSON (P. G.). **Substitutes for Arsenate of Lead used as Sprays for Codling-Moth Control during the Season of 1934.**—*Bienn. Rep. Kans. hort. Soc.* **43** pp. 54–59, 1 pl., 2 refs. Topeka, 1936.

During 1934, manganese arsenate (with the addition of an equal quantity of lime), a French synthetic cryolite, and two natural cryolites were compared with astringent lead arsenate as sprays for the

control of codling moth [*Cydia pomonella*, L.] on apple in north-eastern Kansas. Each insecticide was used at the rate of 4 lb. per 100 U.S. gals. spray. The lead arsenate was used alone, but 1 lb. Kolofog [bentonite-sulphur] or ½ U.S. gal. summer oil was added to the synthetic cryolite, and ½ U.S. gal. summer oil to all the other sprays. In each spray programme, 8 cover sprays were applied, timed by bait traps. The synthetic cryolite used with Kolofog gave the poorest control of larvae. All three cryolites used with oil gave slightly better control than lead arsenate or manganese arsenate. Owing to their incompatibility with lime and fungicides, the cryolites and oil can be used only during the latter part of the season. In these tests they were used from the fourth cover spray onwards, following lead arsenate. The residue of these latter sprays is practically impossible to remove. Weather conditions made 1934 an unsatisfactory year for control experiments.

Lamerson (P. G.) & Parker (R. L.). **Substitutes for Arsenate of Lead used as Sprays for Codling-Moth Control during the Season of 1935.**—*Bienn. Rep. Kans. hort. Soc.* **43** pp. 60–63, 2 refs. Topeka, 1936.

During 1935, the insecticides tested in Kansas for the control of the codling moth [*Cydia pomonella*, L.] and the proportions per 100 U.S. gals. spray, were calcium arsenate (1½ lb.), manganese arsenate (4 lb.), and lead arsenate (4 lb.), each with 1 U.S. pt. summer oil as adhesive, and lead arsenate (4 lb.) alone. The adhesive was omitted from the calyx and first 2 and last 2 cover sprays. In all, 9 cover sprays were applied, timed by bait traps. Infestation during 1935 was light, and control was generally good. Foliage damage could not be compared, as heavy russet was caused by unfavourable weather. Lead arsenate and oil gave the best control (77·89 per cent. uninjured fruit at harvest). Lead arsenate was almost as good on the basis of counts of infested dropped apples. Manganese arsenate and calcium arsenate were much less effective. When tested as adhesives and wetting agents in lead arsenate sprays, Vatsol (¼ lb.) and a pine tar soap (1 U.S. pint) gave rather poor results.

Filinger (G. A.). **Chemically treated Codling Moth Bands.**—*Bienn. Rep. Kans. hort. Soc.* **43** pp. 64–68. Topeka, 1936.

A description is given of the methods of impregnating corrugated paper bands with beta-naphthol dissolved in oil for the control of codling moth [*Cydia pomonella*, L.] on apple. By the " cold " method, the solution is diluted with petrol and each side of the band is dipped in it for 1 minute, the band being drained for 20 minutes after each dipping. By the " hot " method, a solution of 1 lb. beta-naphthol in 1½ U.S. pints lubricating oil, usually with the addition of 1 oz. paraffin wax, is heated to about 270°F., and the band submerged momentarily, allowed to cool for a few minutes and then redipped. In tests on the effects of different temperatures of the solution on the amount of beta-naphthol retained by the bands, almost three times as much beta-naphthol was retained at 230° as at 270°F. As beta-naphthol is very volatile at high temperatures, a high percentage probably escapes if the solution is kept hot for long periods, and the last bands to be dipped might not have as much beta-naphthol as the first. Loose bark should be removed from the trunk and main branches before banding.

It is unwise to put bands on smooth-barked trees, as injury is likely to result, but a thin application of hot paraffin wax may afford some protection. In Kansas, bands were less successful in 1934 than in 1933. It was thought that this might be due to the excessively high temperature hastening development, but in a comparative experiment with two lots of 25 larvae, more developed into adults in a cool cave than in the orchard. Although they did not give 100 per cent. kill, the bands were beneficial and are a useful supplementary control measure.

Baker (H.). **The Red Spider on Apples.**—*Bienn. Rep. Kans. hort. Soc.* **43** pp. 94–98. Topeka, 1936.

In view of serious injury recently caused to apple in north-eastern Kansas and north-western Missouri by *Tetranychus telarius*, L., a general account is given of its bionomics and measures for its control.

Gonzalez Gallardo (A.). **El cultivo del ajonjoli en el Estado de Sinaloa.** [The Cultivation of Sesame in the State of Sinaloa.]—*Bol. Dep. Estad. agric. Sec. Agric. Fom. Mex.* no. 121 Suppl. pp. 819–961 multigraph. Mexico, June 1936. [Recd. December 1936.]

A section of this report (pp. 917–923) includes notes on the pests and diseases observed attacking *Sesamum* in the State of Sinaloa, Mexico, where it is at present only cultivated experimentally. The insects include some polyphagous Lepidoptera and Coleoptera, a grasshopper, and Homoptera, the only one considered of importance being an unidentified Aphid. Insecticides that might be used for their control are discussed.

Wille (J.). **De las labores de la sección de entomologia durante el año 1932.** [Work of the Entomological Section in 1932.]—*Mem. Estac. exp. agric. Minist. Fom. Peru* no. 5, pp. 15–59, 27 pls. Lima [1935]. [Recd. November 1936.]

This report on work done by the official entomologists in Peru during 1932 deals with a number of pests, most of which have been noticed from other publications [*R.A.E.*, A **21** 187 ; **22** 187, 474 ; **23** 307 ; **24** 330 ; etc.]

Strickland (A. G.) & Cole (C. E.). **Apple Washing Trials. Tests in 1934 and 1935.**—*J. Dep. Agric. Vict.* **34** pt. 10 pp. 542–552, 7 figs., 2 refs. Melbourne, October 1936.

The following is largely taken from the authors' summary of experiments in Victoria on the removal of arsenic residues from apples sprayed with lead arsenate. Tests in 1934 showed that hydrochloric acid was a more efficient cleansing agent under hand washing conditions than sodium silicate, and that its action was not improved by the addition of salt. Washed fruit in cool storage kept as well as unwashed fruit. Further tests carried out in 1935 showed that for normal residues immersion of fruit in 3 per cent. acid for 2 minutes was effective in removing the arsenic ; both the variety of fruit and the spray programme to which it had been subjected influenced the treatment required ; excessive core rot was caused in varieties of apples with open calyx tubes by deep submersion ; and core rot could be prevented by shallow washing and rinsing in lime water.

Moutia (A.). **Termites in Mauritius.**—*Bull. Dep. Agric. Mauritius* Sci. Ser. no. 21, 30 pp., 21 pls., 14 refs. Port Louis, 1936.

In this survey of the termites of Mauritius, notes are given on the bionomics of most of the species observed by the author, introduced by a general outline of termite economy, the economic damage done by them is briefly discussed and measures for control are suggested.

The commonest species found in wooden buildings is *Calotermes pallidus*, Ramb., a dry wood termite that makes its nests in the infested wood. *Calotermes howa* var. *mauritianus*, Sjöst., is a common semi-damp wood species that nests in dead trees and in rotten stumps but has never been found attacking houses. Of the subterranean termites, *Coptotermes* sp. (near *intermedius*, Silv.) causes serious damage to wooden buildings, making its nests in infested timbers, usually in contact with the soil. In a few cases, it was also found attacking healthy living trees, and old sugar-cane stumps from which the infestation extended to the living shoots. *Heterotermes philippinensis*, Light, which has probably been introduced and also attacks wooden buildings, makes covered runways on the walls or tubes suspended like stalactites in dark warm places. Its nests were not found. In two cases it was observed to attack living plants of cassava (*Manihot utilissima*). *Prorhinotermes canalifrons*, Sjöst., was found in only one locality, where it was infesting panels of *Ravenala madagascariensis* bordering a bungalow built very near the sea-shore, and making runways between them. It had probably been introduced with this wood from Madagascar, where it is known to occur. *Eutermes* (*Nasutitermes*) *voeltzkowi*, Wasm., is the commonest termite in Mauritius, particularly in the coastal belt, and attacks buildings, fence posts, logs and dead trees. Its carton nests are usually found in the tops of trees or in warm damp parts of buildings, but sometimes occur in the soil at the base of trees. They are always connected with the soil by means of wide covered runways, which are often 30–50 yards long. Descriptions are given of the winged adults and soldiers of all these termites. In addition to them, some undescribed species of *Calotermes* were also found. One, which belongs to the subgenus *Procryptotermes* was observed twice, in one case attacking woodwork of buildings in contact with the soil. The others are of the subgenus *Cryptotermes* and attack dry wood in a manner similar to *C. pallidus*.

Storey (H. H.). **Report of the Plant Pathologist. Virus Diseases of Plants.**—*Rep. E. Afr. agric. Res. Sta. Amani* **8** (1935–36) pp. 11–14. London, H.M.S.O., 1936.

From examination of material sent to him, W. E. China found that the Jassids recorded in the previous report [*R.A.E.*, A **24** 187] as *Cicadulina zeae*, China, also included another species, which the author expected him to describe as *C. nicholsi* [actually he described it as *C. storeyi* (**24** 647)]. Experiments in progress suggest that the ability to transmit streak disease of maize is hereditary in *C. zeae* and *C. storeyi* in the same way as it is in *C. mbila*, Naudé. An apparently new virus disease of maize in the Amani district was discovered. It is of a very mild character and is unlikely to be of any economic importance. It was transmitted by the same species of *Cicadulina* as the streak virus, and only by the races of these insects that actively transmit the latter.

In addition to mosaic, another disease of cassava, the symptoms of which are described, occurs in the Amani district and probably elsewhere in East Africa. It is thought to be caused by a virus and is transmissible by grafting, but the insect vector has not yet been discovered.

KIRKPATRICK (T. W.). **Report of the Entomologist.**—*Rep. E. Afr. Res. agric. Sta. Amani* **8** (1935–36) pp. 14–16. London, H.M.S.O., 1936.

This report deals with further studies on a Strepsipterous parasite of *Antestia* attacking coffee in Tanganyika [*R.A.E.*, A **24** 188]. Parasitism by it was shown to render the males sterile, though the gonads are not obviously atrophied as are those of the females. There was apparent immunity from attack by the parasite in 12 individuals with abnormal antennae. Experiments are in progress to ascertain whether the immunity has been transferred to the apparently normal first generation.

Of the bugs of the genus *Antestia*, the commonest on coffee in East Africa and the only one in which the parasite has been naturally found is *lineaticollis*, Stål. Though *faceta*, Germ., was equally readily attacked and the parasite could develop in it, it suffered a greater premature mortality when parasitised, and it is doubtful if the parasite could ever become established in it under field conditions. A third, unnamed form, which is similar to *faceta* but slightly larger, was occasionally attacked, but the parasite larvae seemed unable to complete their development in it. Of these forms, *lineaticollis* and *faceta* are commonly regarded as varieties of *A. orbitalis*, Westw., but the author is inclined to consider that all three are distinct species, as, apart from differences in parasitism, they seem unable to interbreed, and also show some difference in bionomics.

In one district, where fairly frequent counts were made, the percentage of the *Antestia* population rendered sterile by the parasite varied at different times of the year from about 20 to over 80. A small consignment of the parasite was sent by air to Kenya, where it is being successfully bred in the laboratory.

Another species of Strepsiptera was found at Amani parasitising a common Jassid of the genus *Cicadella*, and although it is of no economic importance, it is hoped that a proposed study of its bionomics will be useful for comparative purposes.

SMEE (C.). **Report of the Entomologist.**—*Rep. Dep. Agric. Nyasaland 1935* pp. 23–25. Zomba, 1936.

Climatic conditions in Nyasaland during the breeding season of 1934–35 were unfavourable to the development of *Nomadacris septemfasciata*, Serv. [*cf. R.A.E.*, A **23** 503]. In some districts no eggs hatched, in others no flying swarms developed from the hoppers, and the destruction due to *Empusa grylli*, which began in January 1935, was greater than previously recorded. It was severe even among first-instar hoppers. Late oviposition in February was confirmed in two areas, so that two generations were present in the Protectorate at the same time, with eggs and hoppers in all stages. In the Lower Shire district, where considerable damage was done to cotton and food crops, the first adult swarms of the new generation were reported on 11th February. Owing to weather conditions and the small number of

swarms, flying was at first more irregular than usual, but by May a tendency to enter the hilly country had become evident. In July swarms were reported from the higher altitudes only. Cold weather during the middle of the year not only kept the swarms quiescent but also apparently checked *E. grylli*, as all swarms observed were free from it. Semi-solitary locusts (? phase *dissocians*) were observed. In August the south to north movement began in most districts; it weakened in September, but revived in October in the Lower Shire and Chikwawa districts. This northerly movement from the Zambesi valley has been repeated each year. Oviposition by this generation was first reported on 17th November, coinciding with a 2-inch rainfall, and continued in December in a number of districts, but it was not very extensive, and in some places many of the eggs were attacked by larvae of *Mylabris*. A single swarm of *Locusta migratoria migratorioides*, R. & F., was observed by natives on 19th August in the Upper Shire district.

Observations indicated that a Bostrychid, probably *Apate indistincta*, Murr., occasionally bores in the trunks and branches of tung nut [*Aleurites*], though the mines are usually blocked with gum. A similar gumming effect has been observed on the fruits, where newly hatched Lepidopterous larvae, probably *Heliothis armigera*, Hb. (*Chloridea obsoleta*, F.), have attempted to enter them; no case of complete penetration has been found. A mild attack on tung foliage by the Galerucid, *Exora apicipennis*, Jac., which had apparently spread from sunn hemp [*Crotalaria juncea*], was observed in November. *Aspidiotus lataniae*, Sign., was observed on olives and also on tung at the Zomba Experimental Station, but there are no signs of an increase. Considerable damage was done to foliage of olive trees in the Cholo district by the Tingid, *Teleonemia australis*, Dist., which sometimes causes complete defoliation. The heaviest infestation has been observed from March onwards, but only a few adults were found in December, although the effects of infestation were still noticeable. *Erythroxylon emarginatus* has been found to be a food-plant of the white coffee stem borer, *Anthores leuconotus*, Pasc. *Mesoplatys ochroptera*, Stål, sometimes defoliates *Sesbania* grown for shade. The Chrysomelid attacking *Indigofera* [**22** 120] has been identified as *Phaedonia areata*, F. [*cf.* **23** 666], and the Carabid predatory on it as *Chlaenius* sp.

CHEVALIER (A.). **L'Arachide au Sénégal.**—*Rev. Bot. appl.* **16** no. 181–182 pp. 673–872, 8 pls., 5 figs., 758 refs. Paris, 1936.

Successive sections (pp. 809–816) of this paper on the cultivation of ground-nuts [*Arachis hypogaea*] in Senegal comprise brief reviews of recent work on the control of the Bruchid, *Pachymerus cassiae*, Gyll. (previously identified as *P. acaciae*, Gyll.) in stored ground-nuts [*R.A.E.*, A **24** 239], and on the injury caused to them by *Embia vayssierei*, Navas [**22** 593], with notes on rosette disease, transmitted by *Aphis laburni*, Kalt. [**22** 47], the incidence of which increased in 1935.

KASSAB (A.). **Preparation and Method of Application of the Zinc Phosphide Bait employed in the Control of the Mole-cricket** *Gryllotalpa.*—*Bull. Minist. Agric. Egypt* no. 178, 12 pp., 8 pls., 10 refs. Cairo, 1936. Price P.T.3.

An account is given of the methods and costs of preparing and applying a zinc phosphide bait [*R.A.E.*, A **18** 45] against mole-crickets

(*Gryllotalpa*) in Egypt, where it has proved very effective. Two applications at an interval of 3–4 weeks are usually sufficient and should be given between March and October. In general, about 33 lb. of bait is enough for an acre. Precautions to be taken in preparing and handling the bait, and the treatment of cases of poisoning are discussed. Dead crickets should be taken away and destroyed daily, after 10 days any remaining bait should be buried, and domestic animals should not be allowed access to treated land for 8–10 days.

MURAYAMA (J.). **Expériences sur l'emploi des insecticides contre les deux chrysomélides : *Agelastica coerulea* Baly et *Melasoma adamsi* Baly. II.** [*In Japanese.*]—*Bull. For. Exp. Sta. Chosen* no. 21, 139 [10] pp., 10 pls., 1 fldg table, text-ill., 35 refs. Keijo, 1936. (With a Summary in French.)

Methods of control for the Galerucid, *Agelastica coerulea*, Baly, and the Chrysomelid, *Melasoma adamsi*, Baly, attacking alders in Korea are discussed on the basis of work since the last report [*R.A.E.*, A **23** 340], and notes on their bionomics are given. *Agelastica* is the more abundant and is distributed generally throughout Korea, while *Melasoma* is restricted to the central region. Both have only 1 generation a year, the winter being passed in the adult stage. The chief natural enemies are the Coccinellid, *Aiolocaria* (*Ithone*) *mirabilis*, Motsch. [*cf.* **24** 206] and a pheasant. Forests with a rich undergrowth suffer less from the beetles than do those in dry localities, where there is little moss or other shelter for potential enemies.

Of 26 insecticides tested the most efficient were three derris preparations, a kerosene emulsion, and pyrethrum soap. They should be applied when the larvae have just hatched, or when the adults are emerging, as the eggs and pupae are very resistant. *M. adamsi* is more susceptible to insecticides than is *A. coerulea*.

CORBET (A. S.). **Biological Processes in Tropical Soils with special Reference to Malaysia.**—8vo, xiv+156 pp., 16 pls., 10 figs., 25 refs. Cambridge, W. Heffer & Sons Ltd., 1935. Price 7*s.* 6*d.*

A few pages in this work are devoted to the insects that occur in tropical soils. Of these, *Coptotermes curvignathus*, Hlmgr., is a serious pest of rubber both in Sumatra and in the Malay Peninsula. It occurs chiefly on low-lying land in moist situations and can kill young healthy rubber trees, which it reaches by underground galleries, encasing the lower part of the trunks in mud. The bark is attacked, and long tunnels are made in the wood. This is followed by an attack on the root-system, by which time the tree is injured beyond recovery. Once the termite has become established on an estate, its complete eradication is hardly practicable. *Eutermes hirtiventris*, Hlmgr., has also been found attacking adult rubber trees in Malaya in a similar manner.

During the last few years a few rubber estates in Malaya have been infested by the Melolonthid, *Psilopholis grandis*, Lap., which appeared in numbers on an estate in Java some years ago. The eggs are laid in the soil, and the larvae feed on the roots of growing plants. On estates where they are numerous, their progress underground can be traced by the decay of vegetation, and it is impossible to establish a cover. In Malaya they are attacked by the Scoliids,

Campsomeris javana, Lep., and *C. pulchrivestita*, Cam., the larvae of which are themselves parasitised by the Bombyliid, *Hyperalonia tantalus*, F.

Franssen (C. J. H.). **Insecten, schadelijk aan het maisgewas op Java.** [Insect Pests of the Maize Crop in Java.]—*Landbouw* **12** pp. 57–105, 3 pls., 2 pp. refs. Buitenzorg, 1936. (Also as *Korte Meded. Inst. PlZiekt.* no. 22.) (With a Summary in English.) Price *Fl.* 0.55.

The following is largely taken from the author's summary : Notes are given on the bionomics of 41 insects attacking maize in Java, with suggestions for their control. Most of them are minor pests, but the 11 mentioned below cause serious damage occasionally, and are dealt with in somewhat greater detail.

The larvae of the Melolonthid, *Lachnosterna* (*Holotrichia*) *helleri*, Brenske, and the Rutelid, *Anomala antiqua*, Gyll. (*Aprosterna aerea*, Perty), attack the plants underground. The total life-cycle requires about a year, the adults swarming in the first month of the rainy season. The larvae of the Curculionid, *Hypomeces squamosus*, F., also attack the roots and are very injurious in some districts during the earlier part of the rainy season. The adults appear in January and oviposit in July or August. At Buitenzorg, the egg-stage lasted 11 days and the pupal 15. The larval stage required several months.

The Lepidopterous pests are *Agrotis* (*Rhyacia*) *ypsilon*, Hfn., *Euxoa segetum*, Schiff., and *E. interjectionis*, Gn., which cut off the plants near the ground and may be controlled by placing baits consisting of slices of sweet potato poisoned with a suspension of 6 per cent. sodium fluosilicate at the base of the plants, *Sesamia inferens*, Wlk., which bores deep into the stem, *Laphygma exempta*, Wlk., which feeds on the leaves, and *Pyrausta nubilalis*, Hb., only two serious outbreaks of which have been observed in Java by the author.

Valanga nigricornis, Burm., breeds chiefly at the edges of teak forests or in clearings within them, but the adults fly to cultivated areas nearby. The larvae of the Meloid beetle, *Epicauta ruficeps*, Ill., feed on egg-masses of this Acridid, but the adults sometimes cause injury to the leaves of maize.

Meyrick (E.). **Exotic Microlepidoptera, 5, pt. 2.**—pp. 33–64. Marlborough, Wilts, the author, October 1936. Price 3*s.* per part.

The new species described include *Epicephala vermiformis*, from *Cajanus indicus*, and *Acrocercops erebopa*, from *Derris* sp., in Java ; and *A. symbolopis*, from *Achras sapota*, in Siam.

Cook (J. H.). **A Contribution towards a Study of** *Calosoma inquisitor* **L. (Coleopt., Carabidae).**—*Trans. Soc. Brit. Ent.* **3** pp. 79–118, 7 pls., 12 pp. refs. Southampton, 20th November 1936.

This account of *Calosoma inquisitor*, L., a Carabid predacious on Lepidopterous larvae, is partly compiled from the literature. Following a brief historical introduction, its geographical races are listed and its

distribution (which is confined to Europe, Asia and North Africa) is shown in detail, the localities of records (with dates) being arranged alphabetically under the countries. It appears to be limited to areas bearing broad-leaved trees, upon which the adults search for caterpillars.

The life-history is summarised, chiefly from work by Burgess & Collins published in a paper already noticed [*R.A.E.*, A **6** 16]. Eggs are laid in the soil in the early summer and hatch in 8–14 days, the larvae making their way to the surface in search of food. The larval stage, comprising three instars, lasts about 24 days. Larvae feed on caterpillars and pupae occurring on the ground and also on one another. The prepupal and pupal stages last 6 and 12 days, respectively, and the beetle emerges from the pupa in the autumn, but remains in the pupal chamber until the following spring. The adults stop feeding between 27th June and 12th July and enter the soil, where they hibernate. They may live for as long as three years. Both sexes are described in detail.

In investigations in Gloucestershire, the beetles were confined in gauze cylinders partly full of soil and buried until the soil inside was on a level with the ground. In the following spring, 80 per cent. emerged from hibernation, and were transferred to containers filled with soil to a depth of about 4 ins., with leaf litter and leafy oak twigs scattered on the surface. Caterpillars and pupae were introduced for food. When the supply of caterpillars declined, the beetles accepted fresh raw meat. Shallow vessels containing water were placed in the cages, and when dry, the soil was sprinkled with water. Under laboratory conditions, the beetles normally emerged from hibernation in May. Their feeding period, which lasts until about a fortnight before hibernation, corresponds closely with that of their chief prey, the defoliating caterpillars. A list is given of 16 species of Lepidopterous larvae that were the chief food of the beetles in the experiments. In order of preference they ate Geometrid larvae, Tortricids, other smooth larvae, fairly hairy larvae, very hairy larvae and lastly pupae. Tipulid and Melolonthid larvae and raw meat were also readily attacked ; small earthworms were accepted when food was scarce. One pair of beetles ate 86 Geometrid larvae in 21 days, and another pair, 65 mixed larvae in 25 days. The average consumption of 3 pairs of beetles during the active period of 41 days was 120 caterpillars per pair. More food was eaten at high temperatures than at low ones. Beetles lived for 9–10 days without food, but would sometimes eat one another. They are negatively heliotropic, and cold weather causes them to go underground. Some were immersed in water for over 48 hours without ill effects. Under laboratory conditions, females frequently do not reproduce for 2 successive years ; according to Burgess & Collins, all the species of *Calosoma* they investigated, including *inquisitor*, had one generation a year.

No insect or fungous parasites of the adults have been recorded, but they are probably the prey of birds. Wilt disease of caterpillars is not transmitted to the beetles, nor are they affected by contact insecticides applied to the caterpillars, apart from the resulting deprivation of food. Numerous records are given of the value of *C. inquisitor* as a predator. In Britain it is found in close association with oaks, and in Gloucestershire it occurs wherever *Tortrix viridana*, L., *Cheimatobia brumata*, L., and *Erannis* (*Hybernia*) *defoliaria*, Cl., are defoliating oaks. Its distribution is localised even within a single forest.

Greenslade (R. M.). **Horticultural Aspects of Woolly Aphis Control together with a Survey of the Literature.**—*Tech. Commun. Bur. Fruit Prod.* no. 8, 88 pp., 49 pp. refs. East Malling, Kent, October 1936. Price 2*s.* 6*d.*

This paper was prepared as a guide to the published literature on *Eriosoma lanigerum*, Hsm., as a pest of apple trees, with the object of discussing the chief points of interest from the horticultural aspect. The information given is supplemented from answers to a questionnaire sent to the temperate countries of the world where the Aphid is a pest. The scope of the paper is summarised by the author as follows : The published information on *E. lanigerum* is reviewed, and the aspects of the problem which are most interesting to horticulturists are fully discussed. The insect and its habits in Europe and America are described and an account is given of the damage done by it. The effect of climate on the seriousness of its incidence is noted. The control of the insect by spraying, by biological methods, and by the use of resistant varieties, is considered. An annotated bibliography of 600 references is appended.

Vayssière (P.). **Les punaises du blé.**—*Bull. Éc. franç. Meunerie* no. 51 pp. 179–189, 8 figs., 12 refs. Paris, 1936.

This is a summary of knowledge on wheat bugs, which are becoming increasingly important in countries bordering on the Mediterranean. A list is given of eleven recently taken on wheat in Alsace, of which the most abundant were *Eurygaster hottentota*, F., *E. maura*, L., *Carpocoris pudicus*, Poda (*purpureipennis*, deG.) var. *fuscispinus*, Boh., and *Syromastes marginatus*, L. A brief general description is given of all stages of *Eurygaster* and *Aelia*, the genera of greatest economic importance, together with an account of the bionomics of *Eurygaster austriaca*, Schr. [*R.A.E.*, A **24** 217] and *Aelia triticiperda*, Pomel [**23** 292], and diagrams showing the concordance between their life-cycles and the growth of wheat in Morocco. *Aelia* spp. feed almost exclusively on graminaceous plants, but *Eurygaster* spp. are also found on other plants, some of which are mentioned. The injury, natural enemies and control methods are discussed from the literature.

Della Beffa (G.). **Contributo alla conoscenza degli insetti parassiti dei pioppi. Il *Phloeomyzus passerinii* Sign. (Afide lanigero dei pioppi.)** [A Contribution to the Knowledge of Insects attacking Poplars. *P. passerinii* (Poplar Woolly Aphis).]—*Boll. Lab. sper. R. Osserv. Fitopat. Torino* **13** no. 3–4 pp. 17–23, 4 pls. Turin, 1936.

In 1934, an outbreak of *Phloeomyzus passerinii*, Sign., occurred in the district of Vercelli, Piedmont, especially on Canadian poplars from 5 to 8 years of age, the infested bark coming away from the trunk, so that the tree withered above it. Details are given of the effects of different degrees of infestation ; about 7,000 trees had to be felled because they were dead or dying. The only form of the Aphid found to occur in Piedmont, even in winter, was the apterous viviparous female ; this form is described, and descriptions of the other forms are translated from Theobald's monograph [*R.A.E.*, A **17** 321]. Infestation became evident in April on trunks of a diameter greater than 7–8 inches. The

successive generations overlapped, but it is thought that 9 or 10 occur in a year. A few sporadic infestations of white poplar were noticed, but as a rule the attack was confined to Canadian poplar. Predators, which were of little importance, included Coccinellids, Syrphids and a species of *Hemerobius*.

Della Beffa (G.). **Contributo alla conoscenza degli insetti parassiti dei pioppi. II** *Trichiocampus viminalis* **Fall. (Tentredine del pioppo tremolo).** [A Contribution to the Knowledge of Insect Parasites of Poplars. *T. viminalis*.]—*Boll. Lab. sper. R. Osserv. Fitopat. Torino* **13** no. 3–4 pp. 23–31, 2 figs., 4 pls. Turin, 1936.

Descriptions are given of all stages of the sawfly, *Trichiocampus viminalis*, Fall., which is abundant in the Alpine region of Piedmont, where its attacks are confined to aspen [*Populus tremula*]. In 1935 and 1936, it completely defoliated the trees in some districts. The mature larvae hibernate in cocoons in the soil. In 1936, adults were observed emerging from mid-April to mid-July, and some of the larvae appeared likely to pass a second winter in their cocoons before pupating. The adults lived for about a fortnight, and pairing took place on the same day as emergence. The females laid about 100 eggs each, inserting them in the leaf-stalks. The larvae hatched in about a week and at once began feeding on the lower surface of the leaves. Two endophagous parasites were observed, *Ichneumon annulator*, F., and a fly, probably a Tachinid, but both were unimportant. If control is necessary, the ground under the trees should be cleaned and lime mixed with the soil. A spray containing barium fluosilicate or lead arsenate could also be used.

Schmidt (E. W.). **The Beet Bug.**—*Brit. Sug. Beet Rev.* **10** no. 2 pp. 43–46, 10 figs. London, October 1936.

In view of the fact that *Piesma quadrata*, Fieb. (beet bug), which occurs in England, transmits the serious leaf-crinkle disease of beet [*cf. R.A.E.*, A **16** 591, etc.] in Germany, notes are given on its life-history in the latter country [*cf.* **16** 1, etc.], with short descriptions of all stages. Apparently the nymphs cannot transmit the disease, and the adults can only do so after feeding on diseased beets. Insecticides have proved ineffective for the control of this Tingid, and the only measure in use is the sowing of trap strips [*cf.* **24** 15, 17, 749], which are ploughed under before the crop is sown.

Sweetman (H. L.). **The Biological Control of Insects.**—Med. 8vo xii+461 pp., portr., 142 figs., 31 pp. refs. Ithaca, N.Y., Comstock Pubg. Co., Inc., 1936. Price $3·75.

The purpose of this book is to present an account of the bionomics of the organisms that might be, or are being, used in controlling insect pests, and the methods of handling and utilising them. After an introductory chapter dealing with the theory of biological control, the author discusses the use of resistant food-plants, micro-organisms, the various groups of parasitic and predacious invertebrates, and the predacious vertebrates. The remaining chapters deal with the biological relations of insect parasites and predators, the factors to be considered in biological control work, the methods used in introductions, the results obtained, and the biological control of noxious plants.

Ripley (L. B.), Petty (B. K.) & van Heerden (P. W.). **Studies on Gustatory Reactions and Feeding of Wattle Bagworm, with special Reference to dusted Foliage.**—*Sci. Bull. Dep. Agric. S. Afr.* no. 148, 27 pp., 6 charts, 6 figs., 3 refs. Pretoria, 1936. Price 3*d*.

Natural cryolite applied as a dust to wattle trees not exceeding 30 feet in height is giving satisfactory results in controlling the larvae of *Acanthopsyche junodi*, Heyl., in South Africa [*cf. R.A.E.*, A **22** 352, 590] at costs that are economically sound as regards plantations giving relatively high yields, but the margin of profit from lower-yielding plantations, which represent a considerable proportion of the total acreage, is at present too small in many cases to justify the cost of dusting. In view of this, the experiments here described were carried out ; the results are summarised by the authors as follows :—

The wattle bagworm feeds much less on foliage dusted with natural cryolite than on normal foliage. If the cryolite can be treated so as to increase the feeding on foliage dusted with it, the application now required for lethal effect could be decreased with consequent reduction of the cost of control. With this end in view detailed studies of gustation and feeding have been undertaken.

The reduced feeding is due to both repellence and sickness, the two factors being of similar importance in causing cessation of feeding before a lethal dose is taken. Repellence is correlated with increased activity and is characterised by repeated tasting and turning away, while sickness is associated with inactivity. The repellence is caused by the physical effect of the coarser particles upon the mouth-parts, and not by taste. Cryolite, powdered glass, silica or chalk do not repel if sufficiently fine. Very fine glass and silica actually increase feeding, but repellence results when coarser particles are present in sufficient proportion. Hard particles repel more than soft ones. To eliminate repellence with natural cryolite, a greater degree of fineness is required than that necessary to produce a satisfactory dust cloud and adhesiveness. The size of the particles required to cause repellence probably varies according to the instar. Chemical repellence also occurs when the cryolite is odorised or flavoured with anethol or tannic acid. Bismuth carbonate or sucrose added to the cryolite tend to increase feeding and act as anti-repellents.

Hungry bagworms feed intermittently on normal foliage, being inactive for somewhat more than half of the time. The active periods are divided about equally between feeding and other activities combined. A feeding period of less than 15 minutes on foliage dusted with cryolite is usually long enough to cause cessation of feeding due to sickness, which suggests that this effect may be due to stomachic reaction rather than to the interaction of fluorine and calcium that probably causes the delayed lethal effect. Magnesium sulphate, bismuth carbonate or sucrose added to the cryolite have given evidence of delaying sickness. A search for chemicals having this effect is being conducted in the hope that one may be discovered suitable for adding to cryolite on a commercial basis to induce the bagworms to take a lethal dose before cessation of feeding when lesser applications of dust are used than those now required.

Records on the amount of feeding at different temperatures are submitted, and certain new methods for studying gustation and feeding are described.

Delassus (—). **Un dangereux parasite du trèfle d'Alexandrie.**—*Rev. hort. Algérie* **40** no. 9 pp. 224–225. Algiers, September 1936.

Serious injury to *Trifolium alexandrinum* in the coastal region of Algeria in 1934 and 1936 was found to be caused by *Apion virens*, Hbst. The larvae mine the stems, living just above the root-collar [*cf. R.A.E.*, A **23** 197, etc.], and the adults feed on the young shoots and leaves, on leaving hibernation in April or May. The weevil is found on various other leguminous plants. The only suggested method of control, that of cutting the crop early and harrowing or rolling the land, is difficult to apply as the crops are usually sold standing.

Bredo (H. J.). **Note sur l'hibernation du ver rose au Congo belge (*Pectinophora gossypiella* Saund.).**—*Bull. agric. Congo belge* **27** no. 3 pp. 442–455, 2 figs., 10 refs. Brussels, September 1936.

In view of the occurrence of *Platyedra* (*Pectinophora*) *gossypiella*, Saund. (pink bollworm) in the north-west of the Belgian Congo, the possible physiological reasons for the production of long-cycle larvae are reviewed from the literature. Records of temperature and humidity throughout the year in this area are tabulated, and it is concluded that, if the diapause is due to cold or low humidity, conditions that would induce it do not occur at any time except possibly in the last week of February. A long-cycle larva occurs within the seed in which it has developed, or between two seeds partly hollowed out and stuck together (double seeds). In order to find if this stage occurs, samples of about 11 lb. of seed from each cotton ginnery in the north-west of the Belgian Congo were examined. These samples resulted from the ginning of the second crop. In 717 lb., containing about 3,900,000 seeds, 38 insects were found, of which 9 were larvae and pupae of *P. gossypiella*, 22 were other species (some unidentified), and 7 were dead. None of these was found in groups of seeds adhering to one another, and the adhesion of these seeds was probably due to the action of a fungus. It is thought that none of the larvae of *Platyedra* was in the diapause. It is probable that the diapause does not occur, as the food-plant is abundant in the different cotton-growing areas during the period normally occupied by it, and the climatic conditions are favourable for continual reproduction.

Hargreaves (E.). **Entomological Work.**—*Rep. Dep. Agric. S. Leone 1935* pp. 20–22. Freetown, 1936.

Investigations in Sierra Leone on mosaic disease of cassava [*Manihot utilissima*] failed to demonstrate that it was transmitted by an unidentified Aleurodid [*cf. R.A.E.*, A **24** 636, etc.], which incidentally required 4 weeks to complete a generation, and mechanical inoculation experiments were also unsuccessful. Of 20 varieties of cassava, those that have smooth leaves, which include the types resistant to mosaic, were much less infested by the Aleurodid than the others. Previous results of shade trials on ground-nut [*Arachis hypogaea*] with reference to virus disease [**24** 337] were confirmed, and spacing trials carried out. In these, the final rates of infection were 9, 26, 35 and 35 per cent., respectively, with 9, 10, 12 and 14 in. spacing [*cf.* **24** 285]. The vector of the ground-nut virus, *Aphis laburni*, Kalt., was also observed on cowpea [*Vigna*], and typical symptoms were produced on the latter by Aphids infected with ground-nut virus. Virus diseases were very prevalent

on cowpea, *Canavalia*, and French bean, less so on Lima bean. The viruses were readily transmissible by mechanical inoculation from one plant to another, but the symptoms varied slightly in the different plants.

Fruit-piercing moths did not appear on *Citrus* in quantity until April, owing to the prolonged dry season, but then occurred in great numbers. An account of work on them and their food-plants will be noticed shortly. *Selenaspidus articulatus*, Morg., increased in abundance on *Citrus*, and *Argyroploce leucotreta*, Meyr., was observed on grapefruit for the first time. *Xyleborus morstatti*, Hag., was more abundant than usual on coffee in the latter part of the year, and an alternative food-plant of the coffee berry Lycaenid, *Deudorix* (*Virachola*) *bimaculata*, Hew., in the absence of coffee, was found to be *Heinsia pulchella*.

Maize and millets were attacked by *Aphis sorghi*, Theo., *Diaperasticus erythrocephalus*, Ol., and *Chaetocnema zeae*, Bryant, against which a spray of lead arsenate and nicotine sulphate was effective. *Calandra oryzae*, L., was observed on rice ears in the field, and *Pyrops tenebrosus*, F., on French bean and tomato. Rice was damaged slightly by *Locusta migratoria*, R. & F., mainly in February and March. Probably owing to parasitism in 1934 and the prolonged drought, *Zonocerus variegatus*, L., was scarce.

New records, made as a result of recent identifications, include *Bruchus ornatus*, Boh., on *Vigna sinensis*, *Bixadus sierricola*, White, on coffee, *Pseudococcus citri*, Risso, on *Anisophyllea laurina*, *Monochamus* (*Monohammus*) *ruspator*, F., on cassava, and *X. morstatti* on *Bauhinia tomentosa*.

GRASSÉ (P. P.). **Les termites en Afrique occidentale française. Leur importance économique. Les moyens de lutte.**—*Rev. Path. vég.* **23** no. 4 pp. 265–306, 17 figs., 10 refs. Paris, 1936.

A summary is given of observations in French West Africa on the food of different species of termites, their distribution and the damage they do. Short descriptions of the soldiers of a few species are included. Methods of control are fully reviewed from the literature [*R.A.E.*, A **17** 543, 730; **22** 254, etc.].

BALACHOWSKY (A.). **La cochenille floconneuse. Est-elle indigène dans les forêts de France ?**—*Rev. Path. vég.* **23** no. 4 pp. 307–312, 1 fig., 7 refs. Paris, 1936.

The question of the country of origin of *Pulvinaria floccifera*, Westw., a pest in greenhouses and on ornamental evergreens in temperate climates, is discussed. Authorities differ as to whether it is an introduced or native species in southern Europe, where, however, it has almost always been found on introduced plants. In May 1936, the author found that it was abundant on old holly trees in the depths of a forest at Fontainebleau, and the presence of dried ovisacs showed that it had been established there for some time. As it is most unlikely that it could have been accidentally introduced into such a locality, and as the only trees indigenous to Europe on which it has been found are holly and yew, the author concludes that holly is its original food-plant and that it is indigenous to temperate Europe. It has one generation a year in the neighbourhood of Paris, and two in the warmer climate of the Mediterranean region.

Balachowsky (A.). **L'altise de la vigne nuisible aux fuchsia cultivés.**—*Rev. Path. vég.* **23** no. 4 pp. 313–315, 3 refs. Paris, 1936.

The author considers that *H. ampelophaga*, Guér., infesting vines in the south of France, is a subspecies or race of *H. lythri*, Aub. The two forms cannot be distinguished morphologically, and Picard has succeeding in interbreeding them [*R.A.E.*, A **16** 240]. In 1936 records of serious damage by *H. lythri* to *Fuchsia* in two localities in the west of France were received. The author suggests that there is some danger of other species of this genus being introduced into France on ornamental plants of the family Onagraceae from America, with a resulting possibility of injury to vines.

Bouhelier (R.) & Foury (A.). **Emploi du trichlorethylène pour la désinfection des grains.**—*Rev. Path. vég.* **23** no. 4 pp. 316–323, 1 ref. Paris, 1936.

In the first set of experiments here described, known numbers of beans infested with *Bruchus rufimanus*, Boh., were fumigated in sealed glass vessels with trichlorethylene at the rate of 200 cc. per cu. m. [equivalent to 1 pint per 100 cu. ft.] or higher concentrations for 48 hours, or with 500 cc. for 24 hours. The mortality rate for adults, pupae and larvae, which was 40·5, 75 and 87·8 per cent. in the controls, was 100 per cent. in each case. The reduction in germination was insignificant.

For the next two experiments the amount of trichlorethylene used per cu. m. is given as 300 cc. in the text and 200 cc. in the tables. In the first, a sack containing about 130 lb. of beans was fumigated for 72 hours. All the adults, larvae and pupae were killed and germination of the beans was not affected. In the second, 4 sacks containing about 220 lb. of wheat infested with *Laemophloeus ferrugineus*, Steph., *Tenebroides mauritanicus*, L., and adults, larvae and pupae of *Calandra oryzae*, L., were fumigated for 46 hours. All the insects were killed, but the percentage germination was reduced from 74 in the controls to 63 for whole grains, and from 16 to 1 for broken grains.

Fumigation of a small quantity of wheat at a concentration of 2·5 litres per cu. m. [12½ pints per 100 cu. ft.] for 15 days resulted in the germination of the whole and broken grains being reduced from 81 to 33 and 8 to 4 per cent. respectively. In another experiment, after fumigation for 48 hours at a concentration of 200 cc. per cu. m., 2 adults emerged from pupae in 1 of 3 sacks containing rejected wheat of 3 types, hard, soft and broken, infested with *C. granaria*, L., and *C. oryzae*. In the other 2 the estimated rate of mortality was 100 per cent. The average rate of germination for the 3 sacks was only slightly reduced.

The smell of trichlorethylene persists for at least a month when the grain is kept in closed containers after treatment, and for 15 days in open containers.

Vayssière (P.). **Les stations françaises de désinfection de 1934 à 1936.**—*C. R. Acad. agric. Fr.* **22** no. 27 pp. 934–937, 1 ref. Paris, 1936.

Ethylene oxide is now used for nearly all operations at the fumigation stations established during 1934 at Bordeaux, Le Havre and Marseilles [*cf. R.A.E.*, A **23** 194]. Fresh fruit imported from abroad is the

largest single item fumigated, nearly 10,000 tons being treated yearly in view of the danger of infestation by *Aonidiella perniciosa*, Comst. In addition, consignments of cereals, dried vegetables, etc., have been voluntarily submitted for fumigation.

Research on the technique of fumigation is also carried out at the stations. It was shown experimentally that fumigation for $1\frac{1}{2}$–$2\frac{1}{2}$ hours with ethylene oxide at the rate of 100 gm. per cu. m. [equivalent to 10 oz. per 100 cu. ft.] under a partial vacuum of 50 mm. [1·97 ins.] (after an initial vacuum of 635 mm. [24·9 ins.]) was effective against *A. perniciosa* and other Diaspine Coccids and did not injure the apples under treatment. Effective control of larvae and adults of *Leptinotarsa decemlineata*, Say, was obtained by fumigation of infested potatoes, using 30 gm. per cu. m. for an hour under a vacuum of 50 mm. All stages of insect pests in dried vegetables and grain were killed by fumigation for 2 hours with 120 gm. per cu. m. or for 6 hours with 100 gm., in a vacuum of 60 mm. [2·36 ins.], with an initial vacuum of 700 mm. [27·56 ins.].

Paillot (A.). **Contribution à l'étude des maladies à ultravirus des insectes. (Deuxième mémoire).**—*Ann. Épiph. Phytogén.* N.S. **2** fasc. 3 pp. 341–379, 36 figs., 20 refs. Paris, 1936.

In this paper, which forms part of a study on the virus diseases of insects [*cf. R.A.E.*, A **14** 347], detailed descriptions are given of the histological changes brought about by the infection with polyhedral disease [**24** 456] and pseudo-grasserie 1 and 2 [**24** 78] of the larvae of the Noctuid, *Euxoa segetum*, Schiff., and with polyhedral disease only of the larvae of the Nymphalid, *Vanessa urticae*, L. All these diseases have recently been found in different localities in France. Attempts to infect the Noctuid larvae with pseudo-grasserie 1 by ingestion and by injection were unsuccessful. The proportion of larvae infected in the field increased from 4 per cent. in 1934 to 10 per cent. in 1935. Attempts to infect the larvae with pseudo-grasserie 2, whether by ingestion or by injection, produced in a few of them nuclear lesions that might be attributed to the disease. The rate of infection in the field did not exceed 4 per cent. The experiments with polyhedral disease in these larvae showed that it was practically non-infectious. In the field the rate of infection was rather less than 1 per cent. Larvae of *Vanessa urticae* were infected easily with polyhedral disease, both by ingestion and by injection. In 1935, a local epidemic killed off a very high percentage of the larvae before they pupated. There is a possibility that this disease is hereditary. Cases in which pseudo-grasserie 2 was associated with polyhedral disease, and polyhedral disease with a fungus are briefly discussed.

Rapports sommaires sur les travaux accomplis dans les laboratoires en 1934 et 1935.—*Ann. Épiph. Phytogén.* N.S. **2** fasc. 3 pp. 405–422, many refs. Paris, 1936.

Much of the information in these surveys of work in 1934 and 1935 at different entomological stations in France has already been noticed. At the Bordeaux Station it was found that *Leptinotarsa decemlineata*, Say, was attacked by two indigenous predators, the Pentatomid, *Zicrona coerulea*, L., and the Chrysopid, *Chrysopa vulgaris*, Schn. In studies of the biology of the Pentatomid, *Podisus maculiventris*, Say,

introduced against it from the United States [*R.A.E.*, A **22** 434], Couturier has shown that the females are very fertile, producing as many as 1,100 eggs each ; that at a temperature of 24–25°C. [75·2–77°F.] the life-cycle is completed in less than a month ; and that this species is very resistant to cold.

Experiments on varieties of apple resistant to the woolly aphis [*Eriosoma lanigerum*, Hsm.] seemed to indicate that resistance was considerably decreased by sandy soils and much increased by clays. It has proved difficult to establish the parasite, *Aphelinus mali*, Hald., in some parts of Normandy, because *Eriosoma* does not appear on the branches of the apple trees so early in the season as elsewhere. The discovery in Rouen of colonies parasitised by *A. mali* on *Cotoneaster* bushes suggested that these might be used for the maintenance of stocks of the parasite, but experiments in 1935 were unsuccessful. In the forests of Normandy diseased and injured pines were attacked by the Scolytid, *Hylastes* (*Tomicus*) *palliatus*, Gyll., and the Buprestid, *Melanophila cyanea*, F., which have not previously been found there. A Tortricid, *Philedone* (*Amphisa*) *joannisiana*, Rag., was found infesting lavender in the Basses-Alpes. Insecticides successful against *Acrolepia assectella*, Zell., on leeks in Alsace included a spray containing 1·25 per cent. nicotine with a good wetting agent, and also 2 proprietary rotenone compounds, a powder and a liquid. It is essential for insecticides to reach the heart of the plant.

THORPE (W. H.). **On a new Type of respiratory Interrelation between an Insect (Chalcid) Parasite and its Host (Coccidae).**—*Parasitology* **28** no. 4 pp. 517–540, 24 figs., 20 refs. Cambridge, October 1936.

Eucomys (*Encyrtus*) *infelix*, Embleton, is a parasite of *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.), infesting greenhouse plants in England. It has also been obtained from *Coccus hesperidum*, L., but this is an unusual host. It does not appear to have been recorded outside the British Isles, though it can hardly be a native insect. The author has reared it in large numbers on *S. coffeae*, and gives descriptions of the eggs, the five larval instars and the pupa, and a full account of the peculiar respiratory interrelation between the larva and its host [*R.A.E.*, A **24** 193].

MILES (H. W.). **On the Biology of certain Species of *Holcocneme* Kon. (Hymenoptera-Symphyta).**—*Ann. appl. Biol.* **23** no. 4 pp. 781–801, 2 pls., 4 figs., 19 refs. Cambridge, November 1936.

Descriptions are given of the larvae of *Nematus* (*Holcocneme*) *coeruleocarpus*, Htg., *N.* (*H.*) *lucidus*, Panz., *N.* (*H.*) *crassus*, Fall., and *Pristiphora* (*H.*) *erichsoni*, Htg., together with a key to the adults and an account of their bionomics in Britain.

Eggs of *N. coeruleocarpus* are laid in incisions in the leaves of willow or poplar, and hatch in 8–9 days during May. The male larvae have 4 instars and the females 5, and in the laboratory in May–June the former matured in 14–15 days and the latter in 18–19. The growth ratio of these larvae was 1·43. Pupation took place in cocoons 2–3 ins. deep in the soil, and the pupal stage lasted 21–27 days. The larvae of the second generation usually hibernate as prepupae in their cocoons, but some individuals occasionally emerge after a cocoon stage of 3–4 weeks and give rise to a third generation in early autumn. Arrhenotokous parthenogenesis occurs in this species. It is found in the

northern parts of England, where it is common, and possibly also in southern Scotland. The larvae of *N. lucidus* feed on the leaves of plums and other species of *Prunus*, but are seldom abundant enough to cause much injury. The adults are on the wing from mid-April to mid-May. The eggs hatched in 7–10 days in May. The first four larval instars lasted about 2·5 days each, and the females had a fifth instar that lasted 3·5 days. The average growth ratio was 1·3. The larvae have all entered the soil by the end of June, but do not pupate until the following March or April, there being only one generation a year. The females can reproduce by arrhenotokous parthenogenesis, and the numbers of the sexes are about equal. *N. crassus* is widely distributed in Britain, the larvae occurring on dock (*Rumex*), birch and willow, but little is known of its bionomics. Adults have been taken in May, June and July.

The bionomics of *P. erichsoni*, which sometimes causes extensive defoliation in larch plantations, are summarised from the literature. Adults emerge from late April until the end of July, and are most numerous in late May and early June. In Britain the species is thelyotokous, producing only females. Eggs are laid in the new growth at the tips of the shoots, about 30 in a shoot, and hatch in 8–10 days. In England the larvae pass through 6 instars before maturing, but in Canada there appear to be 5. Possibly the Canadian larvae were males and thus might have had one instar less. When the last adults are emerging, the earliest larvae are almost mature, but rearing experiments showed that they do not give rise to adults in the same year. Some remain in their cocoons through two winters.

Mansbridge (G. H.). **Experiments on the Resistance of the Flour Moth (*Ephestia kühniella* Zell.) to abnormally high Temperatures.**—*Ann. appl. Biol.* **23** no. 4 pp. 803–821, 4 figs., 14 refs. Cambridge, November 1936.

Experiments are described on the resistance to heat of *Ephestia kuehniella*, Zell., in all stages. Tins containing four cultures of normal stock (material obtained from a flour mill and utilised before there had been one generation in the insectaries) in flour about 1 inch deep were heated for 8 hours in an incubator. In each culture were placed tubes containing 250 newly laid eggs. A few minutes after the cultures were placed in the incubator the temperature at the top of the flour was 31°C. [87·8°F.], and after 1, 2, 6, and 8 hours it was 39, 41, 45·5 and 46°C. [102·2, 105·8, 113·9 and 114·8°F.], respectively. These were the lowest temperatures recorded in any of the cultures, and the highest was 50°C. [122°F.]. Complete mortality was obtained in all four tins, and it was also obtained when a similar culture was heated for just over 2 hours, during which the temperature rose from 45 to 48°C. [113 to 118·4°F.]. The control of this moth by heat would be facilitated by the fact that no stage is likely to be much concealed, for the larvae (unlike many of the Coleopterous pests of flour) work on the surface of their food and are thus more exposed. A better control of the eggs is obtained when the humidity is high, a condition that is not favourable to any stage except the adults, and even at a high humidity the adults die before any other stage. A temperature of 45–46°C. [113–114·8°F.] maintained for 3 hours killed all stages.

The following is largely taken from the author's summary of experiments less directly concerned with control work : With eggs exposed to

45°C. [113°F.] and 47°C. [116·6°F.], it is seen that one-day-old eggs are more resistant than older ones, and all eggs are more resistant at low than at high humidities. They appear to be able to cool themselves at low humidities by evaporation of water, being able to lose at least 10 per cent. of their weight in water and cool themselves about 1°C. [1·8°F.] for half an hour. After heating, eggs can regain water that they have lost if they are kept in a moist atmosphere. After heating at low humidities, there is a bigger survival if the eggs are kept in a moist atmosphere than if they are kept in a dry one. There is great variation in stock direct from a mill. Eggs from different pairs of moths may have widely different degrees of resistance. Stock that has been inbred in the insectaries for 12 generations shows less variation in resistance. Larvae are much less resistant than eggs. Larvae of all ages have about the same resistance until they reach the last instar, in which their resistance increases greatly. Pupae are more resistant than feeding larvae or old eggs, but less so than newly-laid eggs. Adults are the most susceptible to heat. At low humidities the females are more resistant than the males.

Cunliffe (N.). **Studies on *Oscinella frit* Linn. Inheritance of Resistance of Oats to Attack by the Fly and the Combination of Resistance with other Characters of Agricultural Importance.**—*Ann. appl. Biol.* **23** no. 4 pp. 822–844, 1 fig., 2 refs. Cambridge, November 1936.

The following is largely taken from the author's summary: As a result of studies on *Oscinella frit*, L., during the years previous to 1928 [*cf. R.A.E.*, A **17** 288], it was considered that an attempt might be made to solve the economic problem presented by this fly in England by hybridisation of oats, using a resistant variety as one parent. No type of oat immune from attack has been found, and the available material exhibits variation in degree of resistance only, the maximum difference between the most susceptible types and the most resistant types at present known being about 30 per cent. The technique adopted is described. The experimental data show that resistance is an inheritable character (or complex of characters), although difficult of precise measurement. Further, it is shown that agricultural quality and resistance to attack are not incompatible. Wet weather conditions during the flight of the fly have a very marked effect in limiting the extent of damage to the crop. It is suggested that varietal differences in extent of attack may be due to varietal differences in crude fibre production or deposition of silica, both tending to increase the larval difficulties and therefore the resistance of the plant.

Ladell (W. R. S.). **A new Apparatus for separating Insects and other Arthropods from the Soil.**—*Ann. appl. Biol.* **23** no. 4 pp. 862–879, 1 pl., 2 figs., 20 refs. Cambridge, November 1936.

The following is the author's summary: The published methods for the separation of insects and other animals from the soil are briefly described. None of these methods being sufficiently rapid or efficient for soil fumigation investigations, a new method has been devised. The principle of the method is flotation by a dense liquid (a solution of magnesium sulphate sp. gr. 1·11), aided by stirring of the soil and a stream of fine air bubbles passing from the bottom upwards through the

mixture of soil and solution. This produces a froth, which contains all the animals, and by raising the level of the liquid in the cylinder the froth is swept over into a tank filled with magnesium sulphate solution ; here is deposited any soil that has been carried over. The clear solution is then passed on to a Buchner funnel, where the insects and other animals are retained. A black filter paper is used in order to show up Collembola and other colourless organisms. The apparatus has many advantages : The separation takes 30–40 mins. for a soil sample of 6–7 lb. weight ; the operation can be carried out in an ordinary laboratory ; all the organisms are concentrated in a small volume of residue, less than 1 per cent. of the original soil, and are undamaged ; and the great majority of the insects come through alive, so that eggs and larvae may be bred out for purposes of identification. A full account is given of the technique employed. The solution may be used again and again, as the clay settles very quickly and the clear liquid may be syphoned or poured off. Very high figures have been obtained for the soil population. These are much in excess of those recorded by most other workers with agricultural soils [*cf. R.A.E.*, A **11** 72] ; for example, from fallow land 60·6 million animals per acre were recorded, and from new grassland, 121·4 million per acre.

MARTIN (J. T.) & TATTERSFIELD (F.). **The Problem of the Evaluation of Rotenone-containing Plants. II.** *Derris elliptica, Derris malaccensis,* **and the " Sumatra-type " Roots.**—*Ann. appl. Biol.* **23** no. 4 pp. 880–898, 2 figs., 11 refs. Cambridge, November 1936.

A description is given of work carried out in an endeavour to characterise more definitely on a chemical basis, the roots of the " Sumatra-type " derris, *Derris malaccensis* and *D. elliptica*, with a view to their evaluation by chemical means. The " Sumatra-type " derris is a variety that has insecticidal properties but yields no rotenone by the normal method of separation of the rotenone-carbon tetrachloride complex. Cahn and Boam (1935) showed that the rotenone is present in a " hidden " form, and may be induced to separate by the addition of an excess of the pure compound.

The following is largely taken from the authors' conclusions and summary : The determinations of purified rotenone, ether extract, dehydro compounds, ether-soluble resin after treatment with potassium hydroxide, and of the rotenone plus " deguelin concentrates " are each shown to be inadequate as a means of assessing the relative insecticidal activities (as measured by their effect on *Aphis rumicis*, L.) of the three varieties of roots. The " Sumatra-type " root contained small amounts of rotenone and deguelin, while some 70 per cent. of its resin was removed from an ether solution by treatment with potassium hydroxide. From the fraction precipitated by the alkali, an optically active resin, appearing rich in toxicarol, was obtained. The root was characterised by the inability of the rotenone to separate directly from a carbon tetrachloride solution of its resin, and this inhibition appeared to be due to the preponderance of the material extractable by potassium hydroxide. The separation of rotenone is apparently dependent upon the relative proportion of rotenone to other resins in the carbon tetrachloride solution, and takes place when the proportion of rotenone to the inhibiting material is sufficiently high, a condition achieved either by the addition of the pure compound, as in Cahn and Boam's method, or by the removal of the non-crystallisable resin by treatment with

alkali. In this case, rotenone will separate readily from a carbon tetrachloride solution from which the toxicarol has been removed. The toxicarol present appeared to play a small but definite part in the insecticidal activity of the root. *D. malaccensis*, from its chemical properties, occupied a position intermediate between the " Sumatra type " root and *D. elliptica*, in that it contained greater amounts of both rotenone and deguelin, with a corresponding decrease in the content of alkali-extractable resin. With *D. malaccensis*, this appeared to be insufficient in amount to inhibit the crystallisation of the rotenone. *D. elliptica* differed from the other two roots in that very little material was extracted by potassium hydroxide from an ether solution of its resin, the extract showing no formation of precipitate. The rotenone present separated readily, and showed little contamination by resin. The possibility of a standard method of rotenone determination, dependent upon suitable pretreatment of the resins, is suggested.

Tattersfield (F.) & Martin (J. T.). **The Problem of the Evaluation of Rotenone-containing Plants. III. A Study of the Optical Activities of *D. elliptica*, *D. malaccensis* and the " Sumatra-type " Roots.**—*Ann. appl. Biol.* **23** no. 4 pp. 899–916, 4 figs., 6 refs. Cambridge, November 1936.

The following is the authors' summary of work on the optical activities of *Derris elliptica*, *D. malaccensis* and the " Sumatra " type of derris root : A study has been made of the rotation of the resins from three types of derris root, and of a fraction rich in toxicarol separated from two of them. No strictly quantitative relation between their rotations and their toxicities to *Aphis rumicis*, L., has been found. The addition of caustic potash [potassium hydroxide] in methyl alcohol to the benzene solutions of the resins induces a characteristic change from laevo- to dextro-rotation in the samples rich in toxicarol. The induced dextro-rotation then declines in value with time. This effect is shown by the " toxicarol " resin. The rate of the decline is accelerated by increasing the amount of methyl alcohol.

Fidler (J. H.). **An Investigation into the Relation between Chafer Larvae and the physical Factors of their Soil Habitat.**—*J. Anim. Ecol.* **5** no. 2 pp. 333–347, 3 figs., 16 refs. Cambridge, November 1936.

The investigations here described were undertaken in England to determine what relation exists between factors making up the microclimate of the soil and the behaviour of the cockchafer larvae that inhabit it. Most of the experiments were carried out on second year larvae of the Melolonthid, *Serica brunnea*, L. The following are the author's summary and discussion : It is pointed out that since the larvae of chafers live in cells in soil, they are enclosed in a microclimate of which the main factors are discussed. The most important of these are proved to be soil heat and soil moisture. The chief characteristics of soil heat are summarised, and it is shown that there is a marked time lag behind the air temperatures, the climate in the soil therefore being less extreme than that above the surface. Soil moisture is considered to consist of three main types, namely hygroscopic, capillary and gravitational, the latter two being the most important to the larvae. Experiments are described in which a relation is demonstrated between the water contents of the soil and the concentration of the body fluid

of the larva. It appears that larvae are unable to survive in an air humidity lower than saturation unless they can form a cell in which air movement is limited ; the larvae are able to raise the humidity a small amount per cent. by evaporation without dangerous loss of body fluid [*cf. R.A.E.*, A **25** 1]. A relation between the freezing points of the larvae and the water content of their habitat is also demonstrated. It is observed that there is little change in the freezing point over the range of moisture usually occupied by the larvae. Above and below this range conditions may be fatal. The survival of these larvae in relation to high temperature and soil water content was also investigated. These experiments prove that there is a steady rise in tolerated temperature as the soil water increases towards 60 per cent. of saturation ; above this point there is, however, a rapid fall.

It is fairly apparent that the mean of the factors controlling the habitat chosen by chafers represents roughly the optimum conditions for the life of these insects. These are, however, continually varying about the mean and thus at different times each may in turn become the limiting factor. In winter it appears that the temperature near the surface of the soil may reach a point below that which the insect can tolerate. The larva is, however, able to evade this by migration down into the soil ; but here it encounters other limiting factors, such as the lack of oxygen and food, both of which are inclined to retard metabolism. In autumn the limiting factor seems to be the excess of soil moisture in the presence of relatively high temperatures ; this condition is in itself inclined to be fatal, but it also induces the development of fungoid and bacterial diseases. In summer conditions may vary in an exactly opposite way to this, in that the larvae may suffer from the lack of moisture. Drought also has the indirect effect of killing the vegetation and thus removing the food supply of the larva at a time when high temperatures have induced rapid metabolism and a particular need for nourishment. It appears unlikely that in areas occupied by *S. brunnea*, the temperature of the soil will reach a point high enough to be in itself fatal to the larva.

WILLE (J.). **Plagas del algodonero en la campaña agricola 1935–1936.** [Cotton Pests during the Season 1935–36.]—*Inf. Direcc. Agric. Ganad. Minist. Fom. Peru* no. 35, 19 pp., 2 figs. Lima, February 1936. [Recd. November 1936.]

The cotton crop in the coastal valleys of Peru was poor in the season of 1935–36, owing to unfavourable weather and insect pests. Infestation by *Anomis luridula*, Gn. (*texana*, Riley) was severe, following high temperatures, and dusting with an arsenical became necessary as early as December 1935, 3 or 4 applications being often required instead of 1 or 2. Morning mists retarded the development of its Tachinid parasite, *Eucelatoria australis*, Tns., which had exercised effective control in the preceding season. In some districts *A. luridula* was replaced by *Alabama argillacea*, Hb. An outbreak of *Aphis gossypii*, Glov., in January 1936 is attributed to moisture from the mists and to destruction of natural enemies by the calcium arsenate used against the leaf-eating caterpillars. In the following month it was brought to an end by natural enemies, of which the most important were Coccinellids of the genera *Scymnus* and *Cryptolaemus*, others being *Chrysopa* spp., a Syrphid and a Braconid, probably *Aphidius phorodontis*, Ashm. *Dysdercus ruficollis*, L., was also favoured by the prevalent high

humidity and caused crop losses of up to 100 per cent. in places. The measures suggested against it include early sowing to ensure the bolls being formed before January when it is abundant, the growing of early varieties, and completion of harvesting as early as possible, followed by careful cleaning up of the fields.

WILLE (J.). **Informe del viaje de observación á los valles de Nepeña, Casma, Culebras y Huarmey. Informe sobre el viaje de inspección al valle de Moquegua.** [Report on the Journey of Observation to the Valleys of Nepeña, Casma, Culebras and Huarmey. Report on the Journey of Inspection to the Valley of Moquegua.]—*Inf. Direcc. Agric. Ganad. Minist. Fom. Peru* no. 37, 20 pp., 6 figs. Lima, May 1936. [Recd. November 1936.]

Injury to cotton bolls in the valley of Nepeña, Peru, in 1936 is ascribed to weather conditions, which fostered the fungi of the genus *Nematospora* introduced into the bolls by *Dysdercus ruficollis*, L. To avoid the influence of the unfavourable weather likely to occur from January onwards, the cultivation of cotton should be advanced [see preceding abstract]. Other cotton pests observed in this valley were *Pinnaspis* (*Hemichionaspis*) *minor*, Mask., *Anthonomus vestitus*, Boh., *Anomis luridula*, Gn. (*texana*, Riley), *Bucculatrix thurberiella*, Busck, and *Mescinia peruella*, Schaus. *A. luridula* was parasitised by a species of *Rhogas*.

In the valley of Culebras, *P. minor* occurred on cotton, lemon and other plants. *Lonchaea* (*Carpolonchaea*) *pendula*, Bezzi, infested fruits of *Capsicum* injured by other causes. *Selenaspidus articulatus*, Morg., was observed on mangos and *Citrus*, and *Anastrepha fraterculus*, Wied., attacked guavas. *Ipobracon rimac*, Wolcott, was abundant in maize fields, and was apparently maintaining effective control of *Diatraea saccharalis*, F. In the valley of Moquegua, *Saissetia oleae*, Bern., and *Coccus* (*Lecanium*) *hesperidum*, L., attacked *Citrus* severely in one district, and the Tineid, *Tortyra fulgens*, Feld., bored in the shoots of figs. Larvae of *A. fraterculus*, which is believed to have been introduced into Moquegua in the summer of 1933–34, were found in guavas, mangos, peaches, pears and apples.

WILLE (J.). **La filoxera de la vid, *Phylloxera vastatrix* Pl., en los valles de Moquegua y Locumba.** [*Phylloxera vitifoliae* in the Valleys of Moquegua and Locumba.]—*Inf. Direcc. Agric. Ganad. Minist. Fom. Peru* no. 38, 24 pp., 15 figs., 7 refs. Lima, June 1936. [Recd. November 1936.]

Phylloxera vitifoliae, Fitch (*vastatrix*, Planch.) has occurred on vines in the valley of Moquegua, Peru, since 1888. It caused serious injury at first, but did not spread to the neighbouring valleys. In 1935, however, it was found in the valley of Locumba, and it is believed, from various observations, that it had existed there for about 10 years. A general account of its biological cycle is given from the literature. The root-gall and leaf-gall forms were the only ones observed, but from morphological characters, the leaf-gall forms are thought to have been derived from the cycle of alatae, sexuales and winter eggs. Nearly all the vineyards in Moquegua were planted with *Vitis vinifera*, and no injury was noticed, though the roots were infested. Furthermore, new vineyards established in ground infested for at least 23 years were not harmed. In Locumba also, no real harm was done, though infestation was general.

Nearly all the gall-infested leaves were near paths or dwellings, and it is concluded that the gallicolae are distributed by man and domestic animals. Of the different varieties of *V. vinifera*, only one was infested on the leaves. This variety had probably been introduced from the Canary Islands during the Spanish conquest, but may have been modified by the Peruvian climate. The radicicolae as a rule infested only the older roots, little harm being done because the young roots were not severely attacked.

GAUNITZ (C. B.). *Ectobius lapponicus* **L. als Vorratsschädling in Lappland, eine alte sicher unrichtige Vermutung in neuer Beleuchtung.** [*E. lapponicus* as a Store Pest in Lapland. New Light on an old and certainly incorrect Supposition.]—*Konowia* **15** no. 3–4 pp. 162–166, 15 refs. Vienna, 15th November 1936.

The cockroach, *Ectobia lapponica*, L., is stated in text-books to be a pest of dried fish in houses in Swedish Lapland, but the author has found that it does not occur indoors and probably feeds on vegetable matter. Fish in houses has, however, been attacked in the past by *Silpha* (*Thanatophilus*) *rugosa*, L., and meat is attacked by *S.* (*T.*) *lapponica*, Hbst. Injury by *S. rugosa* is now unknown, because the forest region in which it occurs is no longer inhabited.

Memoria de la Comisión Central de Investigaciones sobre la Langosta correspondiente al año 1934.—249 pp., 3 fldg graphs, 35 pls., 8 fldg tables, text-ill. Buenos Aires, Minist. Agric. Argent., 1936.

In continuation of field research organised by the Central Commission of Locust Investigations in Argentina in 1933 [*R.A.E.*, A **23** 73], three expeditions were sent out in the winter of 1934 to investigate the hibernation areas of *Schistocerca paranensis*, Burm., in the northern provinces. The reports of the commissions are accompanied by meteorological maps and tables (pp. 65–68 ; 103–123).

In Informe de la primera comisión exploradora (pp. 11–52, 2 maps, 4 pls.), R. M. Bruzzone describes the work in the provinces of Santiago del Estero and Tucumán. The movements of a large immature hibernating swarm found near Antilla in June were followed for a month, during which it moved through several degrees of latitude. The nights and early mornings were passed on trees and shrubs, the locusts flying only during the hours of sunshine. The flights were arrested if the swarm encountered cold air currents or mists, and their direction usually coincided with the wind. No solitary individuals were found, except those believed to be stragglers from swarms. Experiments were made on marking locusts in swarms by a mixture of 10 parts chalk, 10 parts of borate of casein and 1 part of methylene blue, mixed with water at the rate of 1 part to 5. This was sprayed on a resting swarm at night, but did not adhere, and the marks disappeared from the locusts in a few hours. Natural enemies observed included *Coccobacillus acridiorum*, *Hexamermis acridiorum*, *Sarcophaga* sp., and, particularly, the fungus, *Sporotrichum paranense*.

In Informe de la segunda comisión exploradora (pp. 69–95, 11 maps, 3 pls.), P. Koehler records the results of the expedition to the provinces of Salta and Jujuy. Observations on hibernating swarms showed that their movements are regulated by weather conditions, particularly by

barometric pressure and winds, the swarms moving towards cyclonic areas. Mountains may act as obstacles, owing to the low air temperatures prevailing on them, since the locusts cannot fly at temperatures below 10°C. [50°F.]. The swarms usually fly over scrub and dry forests, avoiding humid forests and large open spaces. The night is spent on trees or, if it is warm, on the ground. There is very little feeding and that almost exclusively on the leaves and bark of young shoots of leguminous plants. It is only when the swarms, on migrating southwards in spring, reach more humid regions, that they begin to feed on crops. The change of diet and greater humidity bring about rapid sexual maturation, which is completed in 18–22 days. Scattered locusts, with colouration differing from that of the swarming ones, but believed to be stragglers from swarms, were found on pastures at altitudes of 4,000–8,200 ft.

In Informe de la tercera comisión exploradora (pp. 125–144, 3 maps, 4 pls.), J. B. Daguerre describes the observations made in the Chaco and Formosa Territories. The data on the movements of swarms corroborated those of the other observers. Dispersed locusts, believed to have originated from eggs laid at an abnormally late season, were found in steppes overgrown by tufts of *Elionurus adustus*.

In El "*Sporotrichum paranense*" March. en la lucha contra la langosta (pp. 53–68 ; 2 maps, 3 graphs), by E. F. Godoy, and Enfermedades de la langosta "*Sporotrichum paranense*" March. "*Coccobacillus acridiorum*" d'Her., (pp. 97–123, 9 maps, 2 figs., 2 pls.), by R. Fresa, detailed accounts are given of the fungus. Its culture in the field presented no difficulties, provided that the temperature was about 25°C. [77°F.], but experiments in artificial infection of swarms gave negative results, owing to unfavourable weather conditions.

In Caracteristicas climaticas y botanicas del Territorio del Chaco y Norte de la Provincia de Sante Fé, en las zonas recorridas por la tercera comisión de investigaciones sobre la langosta el año 1934 (pp. 145–156, 1 map), T. Meyer gives a general description and classification of the vegetation of the Chaco.

In Informe preliminar sobre saltonas y langostas de Bowen (Mendoza) y algunas langostas de otras procedencias (pp. 157–172, 3 pls.) and Investigaciones sobre la langosta en la región serrana de Alta Gracia (Provincia de Córdoba) (pp. 173–196, 1 fig., 17 pls.), C. Bruch discusses various colour forms. Descriptions and figures of aberrantly coloured adults and hoppers found at Bowen are given. When kept in cages, these hoppers gave rise to normally coloured adults, suggesting that they did not belong to a distinct phase, but represented a variation due to retarded hatching. On the other hand, green hoppers leading a solitary life among thistles were found at Alta Gracia at the normal time of the year. These and the resultant adults are described in detail, and it is concluded that their occurrence does not yet prove the existence of phases in the Argentine locust. Preliminary experiments indicate that some changes in hopper colouration may be due to different air humidities and to food. In an appendix, notes are given on hatching, moulting and egg-laying on the surface of the ground, ascribed to the unsuitability of the soil.

In Observaciones del Doctor Miguel Fernandez (pp. 197–202), preliminary studies on the distribution of pigments in the locust's body are described. Black pigment is deposited in the chitinous integument, which is shed in moulting, while the yellow and green colours depend on the colour of the plasma of the blood. Suggestions are offered for a

study of pigments from the biochemical, physiological and genetic points of view.

In Estado actual de mis conocimientos acerca del "Champi" (*Trox suberosus*, F.) (pp. 203–216, 1 pl., 3 figs.), P. Denier gives a summary of information on this beetle, which has been regarded as an important predator on locust eggs. Its synonymy and geographical distribution are discussed, and all stages are described. From observations on the feeding habits of larvae and adults in captivity, it is concluded that they never feed on eggs, hoppers or adult locusts, except when these are dead and partly decomposed, and that the presence of large numbers of adult beetles on egg-deposits of locusts is due to that of dead locusts.

In Contribución al conocimiento de la langosta *Schistocerca paranensis* Burm. y sus enemigos naturales (pp. 217–229, 5 figs., 1 pl.), however, K. J. Hayward concludes, on the basis of field and laboratory observations, that the larvae and adults of *Trox suberosus* do feed on locust eggs, destroying up to 100 per cent. of them in nature, if conditions are favourable. The use of these beetles in control is advocated, and a cage suitable for breeding them in large numbers is described. In addition, when the beetles dig their burrows to reach the eggs, they expose them to the attacks of fungi (*Fusarium solani*) and other natural enemies, which include Staphylinids and Carabids (*Selenophorus* sp.). Locust eggs are also infested on a large scale by the larvae of an Anthomyiid, *Phorbia* (*Hylemyia*) *cilicrura*, Rond.

In Informe sobre cebos tóxicos y otros productos para destruir la langosta (pp. 233–238), field experiments on control are described. Baits poisoned with sodium arsenite and cryolite gave 100 cent. mortality in some cases and completely negative results in others. The results depend on the vegetation, the appetite of the locusts and the time of application. Dusting with arsenicals gave good results, while derris powder was very slow in effect.

In Compuestos arsenicales y su forma de acción destructora de la langosta (pp. 239–248), experiments on the contact action of poisons on locusts are described. Adult locusts were killed when they were sprayed with a 4·6 per cent. solution of sodium arsenite, or dusted with dry sodium arsenite. In order to reduce the hygroscopic power of the dust, disodium hydrogen phosphate (Na_2HPO_4) was added to it; this increased the rapidity of the lethal effect, although disodium hydrogen phosphate alone acts very slowly. In order to study its mode of action, locusts were treated by applying minute quantities of sodium arsenite solution to various parts of the body. Death followed in all cases, even when the poison was applied to antennae, eyes, palpi and other sense organs. When it was applied to hoppers just before the last moult, only 15–50 per cent. were killed in 48 hours, which is ascribed to the poison being removed with the integument on moulting. A 4 per cent. solution of sodium hydroxide gave the same results as sodium arsenite. It is concluded that the poison solution applied externally acts on the endings of the nervous system, and that the alkalinity of the poison is of importance for dissolving fats and waxes. The first symptom of poisoning is the paralysis of the respiratory apparatus. Dry poison acts in the same way, and its action is accelerated in damp air because of the hygroscopic power of the arsenite.

A standard 50 per cent. solution of sodium arsenite based on these experiments is now prepared by the Defensa Agricola under the name "Fluido D.A." and sold to be used in 2 per cent. solution as a contact

insecticide against locust hoppers and adults. It is definitely dangerous for green vegetation and must not be used on cultivated plants. A $2\frac{1}{2}$ per cent. solution of ordinary yellow soap can also be used as a contact poison. In experiments, the contact action of colloidal arsenic and sodium silicate was similar to that of sodium arsenite; a less intense reaction was obtained with tannin, while the results with ferric chloride and magnesium sulphate were indefinite.

SHEPPARD (E. H.). **Notes on *Cryptolestes ferrugineus* Steph., a Cucujid occurring in the *Trichogramma minutum* Parasite Laboratory of Colorado State College.**—*Tech. Bull. Colo. Exp. Sta.* no. 17, 20 pp., 13 refs. Fort Collins, Colo., August 1936.

An account is given of studies in Colorado on the biology of the Cucujid, *Laemophloeus* (*Cryptolestes*) *ferrugineus*, Steph., a beetle with a cosmopolitan distribution, the larvae of which feed on a wide variety of grain and animal foods. It attracted attention owing to the trouble it caused by destroying the immature stages of the Angoumois grain moth [*Sitotroga cerealella*, Ol.] when they were being reared in incubators in the laboratory devoted to the breeding of *Trichogramma minutum*, Riley. The technique of rearing, which was carried out at 83°F., is described. A high relative humidity was required.

The females readily deposited their eggs in slits made in cardboard, and the eggs hatched in about 5 days. The duration of larval development, comprising 4 instars, varied according to food, being considerably accelerated when animal food was given instead of grain. Details are given of the results of experiments in which the larvae were reared on 40 different types of food. In all there was a high mortality rate, particularly in the first larval instar. The mortality rates and the average larval periods for larvae reared on white flour, white maize meal, and *Sitotroga* eggs were 75 per cent. and 50·8 days, 60 per cent. and 42·0 days, and 50 per cent. and 24·8 days, respectively. If no food was provided, the larvae died within 24 hours of emergence. About 5 days were required for the pupal period. For 2 adults the preoviposition periods were 10 and 15 days respectively. Over a period of 36 days, batches of 60 pairs of adults fed on *Sitotroga* eggs, dead larvae of the cadelle beetle [*Tenebroides mauritanicus*, L.], white maize meal, white flour, and extracted starch produced 446, 315, 203, 7 and 0 eggs, respectively. There was a high mortality rate among those fed on white flour, and 100 per cent. mortality among those fed on extracted starch. At temperatures of 75°F. and below, the adults were gregarious and extremely inactive.

Natural enemies observed were the Gamasid, *Seiulus pomi*, Parr., attacking the eggs and pupae; the Bethylid, *Cephalonomia waterstoni*, Gah., the adults of which fed on the larvae and eggs [*cf. R.A.E.*, A **22** 315]; and *T. mauritanicus*. Eggs and pupae were also attacked by larvae of their own species.

Conditions of temperature and relative humidity in the *Sitotroga* incubators are ideal for the development of the beetle, the adults and larvae of which feed on the broken or whole grains of wheat as well as on the eggs of the moth. Observations showed that a pair of adults may eat as many as 35 eggs in a day, while 2 larvae consumed 35 and 50 eggs, respectively, between hatching and pupation. Living larvae

of *Sitotroga* have not been known to be attacked, although pupae and dead larvae were eaten readily. Of 100 adults taken from the incubators only 25 were males.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **47** pt. 10 pp. 569–573. Sydney, 1st October 1936.

The insect pests in New South Wales dealt with in this part of a series [*cf. R.A.E.*, A **25** 79] include *Typhlocyba froggatti*, Baker (*australis*, Frogg.) [*cf.* **24** 787] and *Cydia pomonella*, L., on apple, and *Galerucella* (*Galeruca*) *semipullata*, Clark, which causes considerable damage to fig by skeletonising the leaves and feeding on the skin of the fruit. *G. semipullata* lays eggs in batches on the leaves during the early summer. The larvae feed for about 14 days, and then descend from the tree to pupate in the soil or under rubbish. The pupal stage lasts about a fortnight, and several generations occur during the summer. Infested trees should be sprayed with lead arsenate (1 lb. in 40 gals. water) as soon as the larvae appear and before the fruit starts to ripen.

Wallace (C. R.). **The Twig Girdler Moth of Australian Nut Trees.**—*Agric. Gaz. N.S.W.* **47** pt. 10 pp. 566–568, 4 figs. Sydney, 1st October 1936.

On the north coast of New South Wales, the nut trees, *Macadamia ternifolia* and *M. integrifolia*, are frequently injured by the larvae of *Phthonerodes* (*Xylorycta*) *luteotactella*, Wlk. Brief descriptions are given of the larva and adult. Immature larvae were observed in January, from June to August, and in October, and in June and October larvae of the final instar were also present. Pupae have been taken in the field in June, July and October, and an adult emerged on 1st July from a pupa brought into the laboratory on 8th June. The only adult seen in the field was taken in October.

The larvae sometimes occur at the axils of the leaves, where they devour the bark and may girdle the twig, or they skeletonise the basal halves of the leaves under cover of silk webbing, and bind the leaves into clusters. During storms many of the girdled twigs break off. On one small tree, 7 shoots had webs in 1–10 axils, and with one exception all the shoots had lost a twig. About 25 per cent. of the axils on the tree were infested or showed evidence of past infestation. The damage is insignificant on well-grown trees but is likely to check the growth of young ones, on which control measures may be desirable. Experiments were therefore made, using lead arsenate at the rate of 4 lb. to 100 gals. water, with the addition of 1 gal. miscible white oil. In the first test, an infested tree was left as a control and 4 others were sprayed 4 times from September to January. In June, no living stages and only one web such as is made by first-instar larvae were found on the sprayed trees, whereas the unsprayed tree yielded 5 living larvae and a number of fresh webs. In a second test, uninfested shoots on each of 21 trees were tagged, and one of each pair of trees was left untreated, the marked branches of the other being sprayed on 14th June. The trees were examined on 29th October; no lesions had occurred on any of the sprayed branches, but on the unsprayed ones 9 axils on 3 different trees were webbed.

A spray applied in late April would probably protect the trees until October, and possibly two more sprays would be necessary during the period of growth in the summer. A spray of a lower concentration

might be effective, as it collects in the axils where it is most needed, and one containing 3 lb. lead arsenate in 100 gals. water with 1 gal. white oil is suggested.

Browne (F. G.). **Biological Notes on Malayan Ambrosia Beetles.**—*Malay. Forester* **6** [*i.e.* **5**] no. 3 pp. 120–127, 2 pls., 2 refs. Kuala Lumpur, July 1936.

Brief notes are given on the distribution and in some cases bionomics of 28 species of Scolytids and Platypids occurring in forests in Malaya, of which some, including *Crossotarsus impar*, *Platypus transformis* and *Xyleborus pseudopilifer* have been described by Schedl since they were written. Many species appear to be more specialised in their food-plants than was previously believed, some attacking only one family, and a few only a single genus. *Crossotarsus impar* is much the most injurious; it is abundant in Pahang, is found only in the softer-wooded species of *Shorea*, which are the most valuable timber trees, and apparently confines its attacks to living, healthy trees, so that prompt extraction of felled logs, which is commonly employed to reduce infestation, is useless against it. The immature stages of this borer are not known, but adults have been taken in January, February and May. Owing to the spiral form of the galleries, it is usually impossible to obtain a single sound plank from infested logs. *P. transformis* and *X. pseudopilifer* both attack living trees of *Shorea*, but enter them through wounds; *X. pseudopilifer* is also found in other Dipterocarpaceae and in fallen timber.

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Fleming (W. E.) & Metzger (F. W.). **Control of the Japanese Beetle on Fruit and Shade Trees.** [Notes on Sprays against *Popillia japonica* Newm., in U.S.A.]—*Circ. U.S. Dep. Agric.* no. 237 (revd), 11 pp., 9 figs. Washington, D.C., July 1936. [*Cf. R.A.E.*, A **21** 44; **24** 773].

Phillips (W. J.). **A second Revision of the Chalcid Flies of the Genus *Harmolita* (*Isosoma*) of America north of Mexico, with Descriptions of 20 new Species.**—*Tech. Bull. U.S. Dep. Agric.* no. 518, 25 pp., 10 pls., 4 figs., 6 refs. Washington, D.C., September 1936.

Smulyan (M. T.). **A Revision of the Chalcid Flies of the Genus *Perilampus* Latreille occurring in America north of Mexico** [including 8 new species, 2 new varieties, and a list of known hosts].—*Proc. U.S. nat. Mus.* **83** no. 2990 pp. 369–412. Washington, D.C., 1936.

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TAKAHASHI (R.). **A new** *Thoracaphis* [*Nipponaphis* (*Thoracaphis*) *cheni*, sp. n.] **from China (Aphididae, Homoptera).**—*Peking nat. Hist. Bull.* **11** pt. 1 pp. 21–22, 1 fig. Peiping, September 1936.

MENDES (D.). **Uma nova especie do genero** *Tachardiella* **Cock. (Homopt. Coccidae).** [A new Species of *Tachardiella* (*trilobata* from a myrtaceous plant in Brazil).]—*Rev. Ent.* **6** no. 3–4 pp. 374–376, 8 figs., 2 refs. Rio de Janeiro, 30th October 1936.

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